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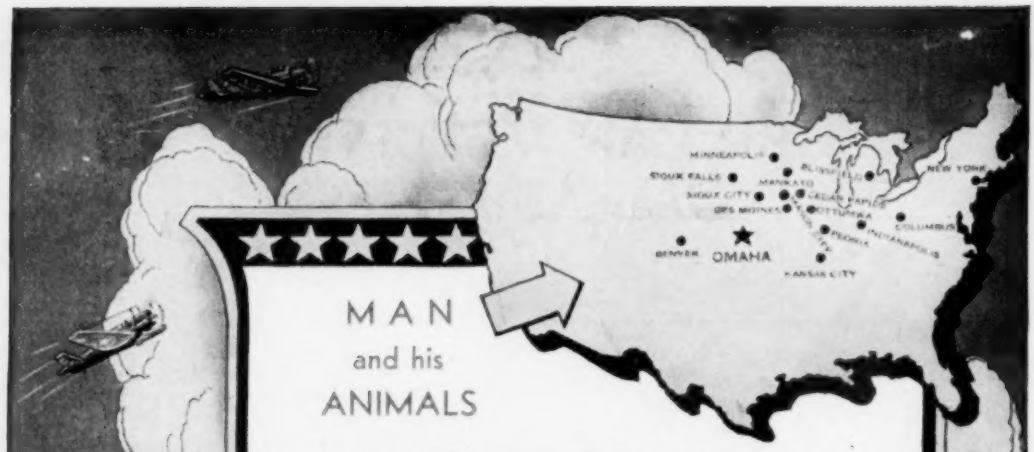

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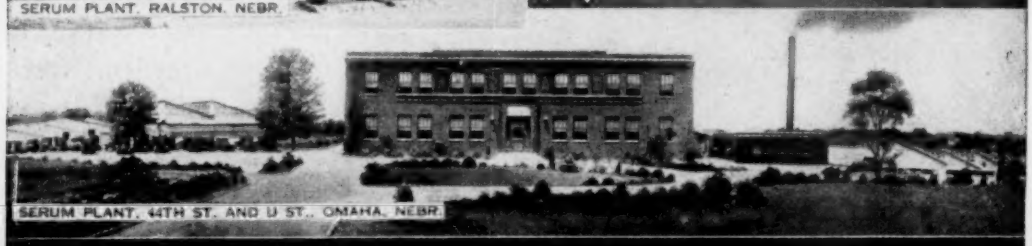

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Streptomycin in Experimental Infections and Its Possible Use in Veterinary Therapeutics

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Rochester, Minnesota

FEW PHASES of medical science have as fascinating a historical aspect as do the discovery and application of the agents called "antibiotic."

Literature Cited

Since 1939, when Dubos[1] reported on gramicidin, and 1940, when the Oxford group[2] made the epochal announcement on the preparation of penicillin, a mass of literature dealing with products of microbial origin antagonistic to pathogenic microörganisms has appeared. The phenomenon of inhibition of one microörganism by another was observed in the earliest days of bacteriology. In 1877, Pasteur and Joubert[3] wrote: "A liquid invaded by an organized ferment or an air-borne organism makes the multiplication of another lower organism difficult even though the liquid in its pure state is suitable to the nutrition of the latter . . . . These facts perhaps allow for the greatest hopes in therapeutics." De Bary[4] emphasized, in 1879, the significance of the fact that when two microörganisms are grown together one overcomes the other. Vuillemin[5] introduced the term "antibiosis", in 1889, to designate the destruction of one organism by another. Brunel[6] contended that Fleming's[7] discovery of penicillin, in 1929, was antedated by a number of workers in the preceding twenty-year period. Hinshaw and Feldman[8] were able to find at least 20 references to papers published in the past sixty years on products of microbial origin that showed some activity against the tubercle bacillus.

The success of penicillin has stimulated intensive search for other antibacterial agents, and a large number have been isolated from cultures of bacteria, fungi, and actinomycetes.

The discovery of streptomycin was not accidental but was the result of organized efforts by Waksman and his group[9, 10] to find an antibiotic substance capable of exerting its effect on gram-negative bacteria *in vitro* and *in vivo*, and having therapeutic value by reason of low toxicity. In addition, a search was conducted to find some product active against the acidfast microörganisms. These workers isolated an actinomycete, *Streptomyces griseus*, certain strains of which produced, in proper mediums, a substance having many desirable antibacterial and pharmacologic properties.

This substance, announced in 1944 by Schatz, Bugie, and Waksman,[11] has been subjected to enough investigations in experimental infections and clinical trials in human disease to allow for some speculation on its place in veterinary therapeutics. We present, briefly, the present information available on streptomycin as a basis for a brief discussion of its use in animals.

Physical Properties and Standardization

As supplied at present, streptomycin is a white or cream-colored powder. It is highly soluble in isotonic saline solution or water, but insoluble in organic solvents.[12] The marked stability of streptomycin is of particular importance. In the dry state, it has retained its potency for many months in the refrigerator, and dilute solutions have maintained their activity at 37 C. for two weeks or longer[10]. We have prepared solutions of the product in liquid synthetic medium containing 10 per cent horse plasma for assaying the sensitivity of tubercle bacilli, and we have not noted any loss of activity when the solutions were stored in the icebox for three to four weeks. Mediums so prepared have apparently retained their activ-

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From the Division of Experimental Medicine, Mayo Foundation, Rochester, Minn.

ity when allowed to stand at room temperature for at least seven days. Cultures of tubercle bacilli in this medium with varying concentrations of streptomycin have remained in the incubator at 37 C. for thirty days with only slight loss of antibiotic activity.

The optimal hydrogen ion concentration for the action of streptomycin is pH 9, and some loss of activity occurs when the pH is reduced below neutral. Since streptomycin is excreted in an active state in the urine and may have some value in treating urinary infections of animals, it is well to remember that herbivorous animals have an alkaline urine, and in carnivorous species the urine is acid.

The unit of streptomycin, called the S unit, was originally defined as the amount in 1 cc. of nutrient broth required to inhibit the growth of a certain strain of *Escherichia coli*. For animal experimentation and clinical studies, this unit was inconvenient because of its small size. Waksman[13], therefore, proposed the L unit, which is the amount necessary to inhibit the growth of the bacterium in 1 liter of medium or equivalent to 1,000 S units. Waksman also proposed the G unit, based on the activity of 1 Gm. of streptomycin base. This is practically equivalent to 1 million S units, which makes it possible to use "microgram" and "unit" interchangeably.

Streptomycin is now being furnished and used in amounts of known weight instead of in amounts based on a biologic unit. It is probable that the term unit will soon be abandoned in favor of the metric weight system. Instead of referring to units it will be proper to use micrograms, milligrams, or grams. Since almost all the work discussed here was done on the basis of the biologic or S unit, that term will be used in this paper.

DOSAGE

Although sufficient data regarding optimal dosage of streptomycin are not yet available, it is known that effective amounts in experimental infections and clinical trials produce very little visible undesirable reaction.

The low toxicity of streptomycin was first shown by Robinson, Smith, and Graessle[14], who found that mice could tolerate as much as 10,000 units in a single dose given subcutaneously, whereas it required only 100 units by the same route to protect against a lethal inoculum of *Salmonella schottmülleri*. Feldman, Hinshaw, and Mann[15] treated 23 guinea pigs with 1,500 units of streptomycin four times a day for 166 days. This treatment was effective in suppressing established tuberculosis in a striking manner. These workers concluded that the antibiotic has little inherent toxicity for guinea pigs. The animals gained in weight and, in 18 examined for hemotoxicity, there was no evidence of it.

Molitor and coworkers[16] found that large doses of pure streptomycin would produce death in mice, guinea pigs, and frogs, but that the amounts required were always far in excess of those required for effective blood levels. Furthermore, it required about ten times as much material given subcutaneously to produce the same effect as when given intravenously. In chronic toxicity tests, rats, mice, and guinea pigs were treated for several months with large doses of streptomycin without showing signs of toxicity. In dogs and monkeys, however, there developed proteinuria, transient anemia, retention of sulfobromophthalein, and the appearance of erythrocytes and casts in the urine. In 3 of 5 test dogs, decreased auditory acuity and impairment of vestibular functions developed. Molitor and his group expressed the opinion that streptomycin is one of the least toxic chemotherapeutic agents and that the effects of huge doses are not of great practical significance.

In a preliminary report, Hinshaw and Feldman[17] described the use of streptomycin in 34 cases of tuberculosis in which 1 million to 2 million units per day were administered. There were no serious reactions even when administration was continued for several weeks. Side reactions such as headache and mild malaise decreased when purified preparations were used. They had 1 case of transient deafness and 3 cases of vestibular dysfunction following administration of large doses of streptomycin over prolonged periods. Four patients acquired a sensitivity to the preparations, but desensitization was readily accomplished. In a later communication based on 75 patients, Hinshaw, Feldman, and Pfuetze[18] stated that streptomycin has low toxicity for man and that the unfavorable reactions were due to impurities, except for the vestibular effects which are obtained with highly purified preparations.[19-22] This low toxicity for man has been observed by others. Whether or not the domestic animals can become sensitized to streptomycin or have any idiosyncrasies to it must await investigation. It is unlikely that many animals will be sufficiently valuable to be treated for prolonged periods. The differences in the metabolic processes in animals will require that toxicity studies be done for each species under the care of the veterinarian.

MODES OF ADMINISTRATION

When given by either the intramuscular or subcutaneous routes, streptomycin is readily absorbed and soon appears in the blood stream. It is likewise rapidly eliminated from the body, chiefly in the urine.[21, 24, 25, 26]

Dorothy Heilman and coworkers[19] observed about 40 patients at the Mayo Clinic and concluded that high concentrations of streptomycin could be built up in the blood stream but that the substance should be given every three or four hours. In 1 case, for example, after a single subcutaneous injection of 200,000 units the blood level of streptomycin per cubic centimeter was 12.5 units in half an hour, 6 units in two hours, and down to 3 units in six hours. If it is learned that frequent injections are necessary for various diseases of animals, the

usefulness of streptomycin in veterinary practice will obviously be limited.

The authors cited previously[19] have also found that streptomycin is excreted and concentrated in the bile, is present in fetal circulation, but apparently does not pass the blood-brain barrier to appear in the spinal fluid. It was observed that half to three-fourths of the streptomycin is excreted in the urine in the first twenty-four hours. When as much as 500,000 units were given orally, none appeared in the blood or urine. Reimann and his associates[37] found that, even with orally administered doses up to 4 million units, only traces appear in the blood or urine. Of great importance was the finding that streptomycin passes through the bowel unchanged and exerts its effect on the normal flora as well as the pathogens.

Smith and Robinson[38], and Emerson and Smith[39] have demonstrated that the oral administration of streptomycin to mice and rats in doses well below the toxic levels will greatly reduce the numbers of coliform microörganisms in the feces. With 300,000 units, which is a twentieth of the maximal tolerated dose, it was possible to sterilize the feces completely from coliform bacteria in twenty-four hours and markedly reduce the numbers of other bacteria.

Studies in Vivo and in Vitro

Streptomycin is bacteriostatic for a wide variety of bacteria *in vitro* in low concentration. Among those of importance in animal diseases are the tubercle bacillus[20], members of the Salmonella[21] and Shigella groups[10,14], staphylococci and hemolytic streptococci[22], *Brucella abortus*[23], *Actinomyces bovis*[25], *Erysipelothrix muriseptica*[32,34], *Bacillus anthracis*[33], and *Pasteurella tularensis*[35,36]. *Malleomyces mallei* was found to be quite resistant to streptomycin *in vitro*, requiring ten or more units to inhibit growth.[35] Streptomycin apparently has a limited activity against the spore-forming anaërobes[14].

In vitro studies of the bacteriostatic properties of streptomycin must be done and interpreted with caution. Such studies are of value only as a guide and are undertaken because little material is necessary and results are determined in a shorter time than if animals are used. However, activity *in vitro* may be no measure of activity *in vivo*. Heilman[23] found that some microörganisms of the hemorrhagic septicemia group were moderately susceptible to streptomycin *in vitro*, but in experimental infections in mice the material gave no protection at all.

Results of *in vitro* studies on a few strains of bacteria within a species are not conclusive because it has been shown that different strains of the same species will vary greatly in their sensitivity to streptomycin[25,32,36]. It is difficult to make comparisons of results reported by various workers unless the technique used and the composition of the medium are known. The composition of the medium must be such that it contains no materials that will interfere with the activity of streptomycin. Two per cent glucose will partially inhibit streptomycin[19], as will also thioglycollic acid[19]. The use of this or other reducing agents in anaërobic mediums used for sensitivity studies may give results difficult to interpret.

In vivo studies indicate that streptomycin is effective in controlling experimental infections produced by a variety of gram-negative bacteria and the tubercle bacillus. The first report, made by Jones and her associates[24], showed that mice could be protected against *S. schottmülleri*, *Shigella gallinarum*, and even against *Pseudomonas aëruginosa*, which is resistant to other antibiotics. They also found that chicken embryos could be protected against infection by the fowl typhoid microörganism and *Br. abortus*. Experimental infection in mice due to the gram-positive *Diplococcus pneumoniae* and *Staphylococcus aureus* could be successfully controlled by streptomycin according to Robinson and coworkers[14].

Heilman[27] found that the microörganism of tularemia was inhibited *in vitro* by as little as 0.15 unit of streptomycin per cubic centimeter of medium. *In vivo* tests showed that mice could be protected against 100 times the lethal inoculum of *P. tularensis* by injecting 1,000 units daily. Treatment was started eight hours after inoculation and continued for ten days, at the end of which time all the controls were dead and the treated animals were still living. Six of the 30 treated animals were examined two weeks after cessation of treatment; none showed gross evidence of the disease nor was it possible to recover the microörganism by culture or mouse inoculation.

Specific Diseases Treated

Tularemia.—As a result of Heilman's experience and their own finding that streptomycin had definite curative effects in experimental tularemia, Foshay and Pasternack[28] treated 7 patients who had the disease. The rapid relief from symptoms that had lasted for many days led the authors to infer that bacteriostasis took place within the first twelve hours. One patient had suffered from the disease for one hundred and three (103) days and had tularemic peritonitis when treatment was started, but after four days of streptomycin therapy there was a dramatically favorable response. Abel[26] treated 3 patients who had tularemia and concluded that streptomycin appears to be specific for the disease, judging from the rapid improvement immediately following its use.

Brucellosis. — Live, Sperling, and Stubbs[29] found that streptomycin had a definite deterrent effect on experimental brucellosis in guinea pigs. Herrell and Nichols[30] reported the treatment in 8 cases of bacteriemia due to gram-negative bacteria. Three of these were cases of severe undulant fever. While it was possible apparently to sterilize the blood stream temporarily from Brucella, the course of the disease and change in the patients' well-being were not permanently altered. In 1 case, however, the patient experienced a good response to streptomycin therapy following splenectomy.

This case is of particular interest because the patient was a veterinarian who had been ill for about a year, during which time positive blood cultures had been obtained. When

seen at the Mayo Clinic, he was acutely ill and had an enormous spleen. After twenty days of streptomycin therapy, his condition improved and blood cultures were reported as negative. When treatment was discontinued for a week, his symptoms recurred and it was possible to recover *Br. abortus* from the blood stream. A second course of streptomycin therapy was instituted, resulting in abatement of symptoms which again recurred on cessation of treatment. The spleen was removed and found to be laden with *Br. abortus*. Following splenectomy and a nine-day course of streptomycin therapy, his blood cultures became negative and remained so. Four months later, the patient was well and had regained his normal weight. The huge spleen was apparently a reservoir of the infection not affected by the antibiotic.

Pneumonia. — Streptomycin suppresses the growth of the Friedländer bacillus *in vitro* and also has a striking protective action in mice against experimental infection with this microörganism[40]. In human infections due to *Klebsiella pneumoniae*, Herrell and Nichols[39] were successful in eliminating the microörganisms in 5 of 6 cases. The bacterium became resistant to streptomycin in 1 case of ozena.

Leptospirosis.—The inhibitory action of streptomycin extends to include spirochetal microorganisms. Heilman[41] has demonstrated that the drug exerts a protective action on experimental relapsing fever in mice. Of special importance to veterinarians is his report that experimental infection due to *Leptospira icterohaemorrhagiae* in hamsters is controlled by streptomycin. Twenty of 50 infected animals were treated for ten days starting seventeen hours after inoculation. They received daily 1,000 units in four doses. The untreated, infected animals died in six to nine days, but those that received streptomycin remained well. It was not possible to recover Leptospira from the treated animals three weeks after cessation of treatment. The closely related Leptospira of dogs should exhibit a similar susceptibility to streptomycin.

Trypanosomiasis.—The antibiotic is not active against fungi[10], *Trypanosoma equiperdum*[12], or the parasites of avian malaria[42], nor does it inactivate tetanus toxin[43]. According to Waksman and Schatz[10], it has no effect on the few viruses tried.

Tuberculosis.—The most extensive use of streptomycin in experimental disease has been the work of Feldman, Hinshaw, and Mann[15], in which they showed that the drug exerts a marked activity in resolving or suppressing established tuberculosis in the guinea pig. Two preliminary experiments[44] were done in which it was found that streptomycin prevented the development of tuberculosis in guinea pigs when treatment was started the same day as infection and, more important, it had an impressive deterrent effect on the disease when treatment was delayed for two weeks.

A third study was made in which the conditions imposed placed a more severe test on streptomycin. Fifty-nine guinea pigs were inoculated with 0.001 mg. of virulent human tubercle bacilli and in forty-two days all were found to be sensitive to tuberculin. On the forty-eighth day, a portion of liver was removed for study prior to treatment. Ten animals died from the surgical procedure and in 8 there was definite gross evidence of tuberculosis. On the forty-ninth day of infection, 25 guinea pigs were started on streptomycin treatment of 1,500 units four times a day, given subcutaneously.

Treatment continued for 166 days, when the experiment was ended and the survivors were killed. Just prior to termination of the study, all the surviving animals, 8 controls and 23 treated animals, were tested with tuberculin. Nine of the treated group failed to react. During the 215 days of the experiment 17 (71%) of the untreated animals died in contrast to a loss of only 2 (8%) of those that received streptomycin. There was a relative absence of gross tuberculous lesions in the treated group as compared with the widespread, visibly destructive, tuberculous process in the lungs, liver, and spleen of those that received no treatment.

Specimens of spleens were obtained from each animal at necropsy and used for culture and guinea pig inoculation. It was not possible to demonstrate tubercle bacilli in 6 of the 9 treated animals that failed to react to tuberculin.

The biopsy specimens made prior to treatment revealed, microscopically, the same degree of progressive disease in both groups. When the biopsy specimen of liver obtained prior to treatment was compared with the necropsy specimen from the same animal, it was evident that the treatment had caused a resolution of the tuberculous lesions that existed before streptomycin was administered. In 13 of the 25 treated animals, there was neither gross nor microscopic evidence of tuberculosis and only a slight degree of recognizable infection in others.

We have further evidence of the striking deterrent effect produced by streptomycin in experimental tuberculosis in an experiment that is still incomplete. Twenty-four guinea pigs were inoculated intravenously with 1.0 mg. of virulent, human tubercle bacilli. Six were started at once on streptomycin therapy with 1,500 units four times daily and, in 6, the treatment was delayed four days. The 12 untreated animals died in an average of nineteen days. Histologic examination of their organs revealed the tissues to be teeming with acid-fast bacteria. Treatment of the first group was continued for sixty days. One animal died of nontuberculous causes, two days after infection, but the others remained well. Following cessation of treatment after sixty days, 2 of the animals died, but there is some doubt as to the cause of death. The other 3 were alive and well at the time when this paper was written, one hundred and four (104) days after treatment was stopped. They were sensitive to tuberculin two months after treatment was discontinued. The guinea pigs in the second group have received treatment continuously for more than five months and are apparently healthy animals. They were still tuberculin-positive four months after infection. An interesting approach to the chemotherapy of experimental tuberculosis is that of Smith and Mc-

Closky[46], who combined promin and streptomycin therapy and reported better results than with either drug alone.

Tuberculosis in Man.—The most that can be said for the use of streptomycin in tuberculosis of man is that the results obtained so far are encouraging. Hinshaw and Feldman[8,17,18] expressed the belief that, although the drug appears to modify the course of the disease in a favorable manner, it must not be considered as a substitute for any other form of treatment. In 19 of 24 cases of pulmonary tuberculosis with an unfavorable prognosis, there was evidence of improvement within four to eight weeks after treatment was started. The rate of improvement was frequently not greatly accelerated when compared with that of similar, but untreated, patients who had had a better prognosis, nor was there any evidence of rapidly effective bactericidal action on the tubercle bacilli.

Among the 54 cases of tuberculosis described by Hinshaw and Feldman[17] were 9 with renal involvement. In 8 of these, the urine was temporarily freed of tubercle bacilli and there was improvement of symptoms. The bacilluria has recurred in 6 after cessation of treatment. In 5 patients who had draining tuberculous sinuses, it has been possible to obtain closure of the lesion by treatment with streptomycin, but recurrences developed in 3 when treatment was discontinued. In 2 of these, a second course of streptomycin had effected closure of the sinuses. Tuberculous meningitis has shown at least a temporary promising response to streptomycin therapy, but long term prognosis appears uncertain. Cooke, Dunphy, and Blake[47] reported 1 case in which the drug was given intrathecally as well as by the intramuscular route. The progress of the disease was arrested, symptoms were greatly improved, and the cerebrospinal fluid was freed of acidfast bacilli. Figi, Hinshaw, and Feldman[48] reported a case of tuberculous laryngitis of one year's duration in which there was definite improvement after ten days of treatment and in which the lesions progressed to almost complete healing in six weeks, when the administration of streptomycin was discontinued.

Development of Resistance to Streptomycin

The experience with penicillin and the sulfonamides suggests that pathogenic microorganisms may become resistant or fast to streptomycin. Emerson and Smith[49] found that, although it was possible to reduce the bacterial count greatly in the feces of rats by oral administration of streptomycin, the low numbers could not be maintained in spite of continued treatment. This was found to be due to the development of resistance to the drug. Strains of *Escherichia coli* isolated during treatment were found to be at least 1,000 times as resistant to streptomycin as strains isolated prior to treatment. This fastness appeared within the first twenty-four hours of treatment. However, Reimann, Elias, and Price[37], and Elias and Durso[38], who treated typhoid fever by oral and parenteral administration of streptomycin for as long as fifteen days, reported that *Eberthella typhosa* showed no development of streptomycin fastness in the host. Knop[46] was able to increase the streptomycin resistance of some bacteria from the human urinary tract by repeated culture in increasing amounts of the antibiotic. Such strains retained their resistance after 29 daily transfers in nutrient medium.

Miller and Bohnhoff[20] found that streptomycin-fast meningococci were fully as virulent for mice as the nonresistant strains. Mice inoculated with strains made resistant by *in vitro* methods were not protected by injections of streptomycin. These authors made the important observations that penicillin-fast meningococci and gonococci were susceptible to streptomycin *in vitro* and that streptomycin-fast strains showed no resistance to penicillin. Buggs and his associates[50] were able to isolate streptomycin-fast strains of various bacteria from patients on streptomycin therapy after having recovered sensitive strains prior to treatment. It was assumed that the resistant strain developed from the sensitive ones although these workers raised some important considerations. For example, if several different colonies of *Sta. aureus* from an infectious process are tested for sensitivity to streptomycin all but one may be inhibited. If, at a later date, only one colony is examined and found to be resistant, is it the original resistant strain or one of the sensitive ones that acquired resistance during treatment of the patient?

Youmans and his associates[40] found that tubercle bacilli from patients undergoing streptomycin treatment had a high resistance to the drug, as compared with those isolated before treatment. We have also observed this streptomycin fastness of tubercle bacilli. In 1 case of renal tuberculosis, the resistance of the bacilli increased from 0.15 unit of streptomycin per cubic centimeter of medium to more than 1,000 units within two weeks after several months of treatment. We have not been able to demonstrate the development of streptomycin-fast strains of tubercle bacilli in treated guinea pigs. It has been found that, when resistant strains of tubercle bacilli are inoculated into guinea pigs, they will produce the disease, and when isolated again they show no loss of streptomycin fastness.

Streptomycin in Veterinary Medicine

Any speculation on the use of streptomycin in veterinary medicine must be prefaced by a plea for caution. There are still wide gaps in our knowledge concerning chemotherapeutic agents and their use in animal diseases. Much of our information is borrowed from experience in human medicine, without being critical of the anatomic and physiologic differences among mammals. For example, we know very little about the dosage, absorption, toxicity, elimination, and effectiveness of the sulfonamides in the diseases of the many species we are called on to treat.

Certain chemotherapeutic agents are

found to be effective in controlling experimental disease but are discarded for human use because of toxicity or ineffectiveness. Some of the sulfones, for example, exert a striking suppressive effect on tuberculosis in the guinea pig and are well tolerated by this animal, but they are not well tolerated by, or are ineffective in, man. These and other compounds may find a field of usefulness in veterinary practice even though discarded by the physician for human use. As new chemotherapeutic agents become available, they should be subjected to intensive study in domestic animals instead of using information obtained from laboratory animals and man.

Penicillin is being used rather indiscriminately. Even in bovine mastitis, criteria for selecting proper cases to treat have not been established nor are there many data regarding dosage, frequency of treatment, or judgment of response to the medication. By injudicious use of penicillin and other agents, we may arrive at false conclusions regarding their efficacy unless we can first of all know their limitations in the infections of the various species. Furthermore, we cannot justify the use of penicillin in animals on a trial-and-error method when it is urgently needed for man in disease-ridden areas of the world.

We wish also to emphasize that the control of infectious diseases in domestic animals should be based primarily on prevention, which requires the application of hygienic principles first and immunologic procedures secondly. There is not now, nor is there ever likely to be, a panacea the use of which can allow us to forego strict observance of sanitation and hygiene.

It is unlikely that streptomycin will become available to the veterinary profession for a long time. If it is found to be a valuable agent for treatment of human tuberculosis, the demand will be very great because of the enormous number of afflicted people waiting for relief. The large doses over prolonged periods that would be required would severely tax the present proposed production of streptomycin.

As previously mentioned, one of the limitations on the use of streptomycin in veterinary practice is the requirement of frequent dosage to maintain high blood levels. This may not be of importance in hospitalized cats and dogs, which can be attended frequently, but for farm animals it is obviously not economically feasible. This difficulty may be surmounted by investigating the use of vehicles to delay absorption. Investigation of the matter may disclose that frequent injections of streptomycin may not be necessary for some infections. We have some information that experimental tuberculosis in the guinea pig may respond as well with one daily injection as when the dose is divided into four.

The apparent ease with which certain microörganisms acquire resistance to streptomycin is an important factor to be considered in treating transmissible diseases of animals. We must learn which of the animal pathogens develop streptomycin fastness *in vivo*, how it affects their virulence, and whether or not fastness is retained on cessation of treatment. Will resistant virulent microörganisms be transmitted from treated animals to susceptible animals and produce disease that will not respond to streptomycin therapy?

There are certain diseases of domestic animals for which streptomycin or any other treatment is not indicated in spite of experimental evidence of effectiveness that may be found. Certainly, one would not advocate the treatment of bovine tuberculosis, anthrax, glanders, or rabies.

Use in Specific Diseases.—It is conceivable that in the case of valuable animals an attempt might be made to treat bovine brucellosis. The experience in human cases suggests that the chronic form of brucellosis does not respond satisfactorily to streptomycin therapy. This may or may not be true in animals.

The high concentration of this antibiotic that can be obtained in urine suggests that pyelonephritis in cattle may be effectively treated with streptomycin. Diagnosis based on bacteriologic examination would have to be made early in this intractable disease before the pyoureter and renal destruction become irreparable. Judgment of satisfactory response could be based on bacteriologic examination only.

Actinomyces bovis is inhibited by streptomycin *in vitro*. Since *Actinobacillus lignieresi* is gram-negative, it also may be susceptible to the drug. The granulomatous nature of the diseases caused by these animal pathogens, plus the degree of tissue changes present by the time diagnosis can be made, may require long treatment to effect adequate concentration in the lesion.

Perhaps such treatment can be combined with surgical intervention.

The very slow rate of absorption, if any, from the intestinal tract makes it unlikely that oral administration of streptomycin by admixture with feed will be of benefit, except perhaps in enteritis. The field of use is obviously wide for a nontoxic, antibacterial agent which is active in the intestinal tract and which, by reason of its stability, can be placed in feed and water. Disregarding limitations of cost, one can see an extensive application in poultry practice as a prophylactic measure against the common diarrheal diseases of chicks and poults. The various forms of enteritis of swine present similar possible prophylactic and therapeutic indications. We must learn whether a certain dietary regimen will be required for the greatest enteral activity of streptomycin.

In bovine mastitis, penicillin has been found to exert a bacteriostatic effect on most of the microörganisms of the udder. For the infection that does not respond to penicillin satisfactorily, some other agent may be found. Streptomycin may prove to be an adjunct to penicillin in the treatment of mixed infections, especially when staphylococci are present, and in the acute and dangerous mastitis due to gram-negative bacteria. There are no data available concerning excretion of streptomycin in the milk following parenteral injection in experimental animals or man. It is obviously important to learn whether effective milk levels may be maintained in cattle by intramuscular or subcutaneous injection of streptomycin. The alkaline reaction of milk from an inflamed gland should make such milk a suitable medium for the activity of this antibiotic.

When streptomycin and the other agents become available to the veterinary profession, efforts must be made to insure their use in such a manner that the greatest amount of information can be obtained. The clinical and field trials should be based on actual laboratory evidence of effectiveness in a given disease. Dosages, routes of administration, toxicity, and rates of elimination must be studied, as well as the effect on the etiologic agent itself. Data must be collected from the clinical studies to insure interpretation of results based on well-controlled observations.

If the supply of streptomycin or other agent is at first limited in amount, it should be made available to those groups who, by virtue of experience with a given disease, are best qualified to evaluate its use. It might be well to form some active national organization, the function of which would be to assist in obtaining new materials and to offer aid in gathering and disseminating information.

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—*Acme Photo*

A Washington D. C. Brindle Bull had the misfortune to fall 20 ft., with the pictured result.

Whether we have faith (in our country) because we are fortunate or whether we are fortunate because we have that faith is a question Americans might soberly ask themselves.—*From Nation's Business.*

The Application of Sanitary Science in the Control of Diseases of Domestic Animals

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SANITARY SCIENCE may be defined as that branch of knowledge pertaining to the preservation of health and is, therefore, involved in all rational control of the diseases of domestic animals. The extent of knowledge available determines our ability to formulate a satisfactory and practical program for the control of any disease, but the success or failure of such a program depends on the energy and efficiency with which our knowledge is applied.

In planning a program for the control of any disease of domestic animals, then, we must first assemble the known facts pertaining to that disease. The more knowledge we can obtain about the disease involved, the more efficient and practical the program of control. However, effective control requires prompt action. If some of the knowledge that we should have to formulate a rational program is not immediately available, control veterinarians must assume the most probable facts, or base conclusions on partially proved hypotheses and act accordingly. If the house is on fire, we should not refuse the service of a bucket brigade because the village council is contemplating the purchase of modern fire-fighting equipment some time next week or next year.

Fortunately, certain fundamental principles of control are applicable to any communicable disease. Action based on these principles should be taken immediately when the need arises, whether all knowledge which seems to be desirable is available or not. Measures taken at this time may be later modified if further knowledge of the disease becomes available.

In this paper, no effort is made to discuss these measures in detail or to suggest new procedures. The writer has tried, in the short time allotted, to summarize in an orderly manner the activities applicable to the control of communicable diseases in general, and to outline briefly some ways in which these measures can be improved.

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RESTRICTIONS ON IMPORTATIONS

Exclusion from the area involved of infected or exposed animals or material, including biological products which may contain the living organisms or active viruses causative of disease, is one of the first steps in preventing or controlling any communicable disease.

Regulatory officials of every state are, or should be, empowered to prohibit the importation of livestock into territory under their jurisdictions unless they are properly assured the animals are free from disease or exposure thereto. Enforcement of import regulations, however, requires the coöperation of the officials of other states and the federal government, transportation companies, livestock owners and dealers, and practicing veterinarians. Livestock sanitary officials are, without exception, most coöperative. Reciprocal information is furnished freely and promptly. The nature of their daily duties impresses on them the necessity for complete frankness. Large transportation organizations such as express companies and railroads also coöperate wholeheartedly and make every effort to comply with the regulations of the several states.

Most practicing veterinarians conscientiously conduct their tests and examinations accurately and report them fully and promptly. Regulatory officials should, and usually do, make every effort to include all properly qualified practitioners in the disease-control programs.

Requiring health certificates for all domestic animals moved interstate is standard procedure. Only if such health certificates have been issued by qualified veterinarians and approved by the livestock sanitary authorities of the state of origin should they be accepted.

Many persons who have not had experience in disease control fail to understand the necessity for approval of interstate

health certificates by the livestock sanitary officials of the state of origin. It should be evident that the officials of the state of destination have no knowledge of the standing of the veterinarian issuing the certificate, nor can they be expected to have up-to-the-minute knowledge of the disease status of the various localities or of individual herds or flocks located in other states. Control officials realize their obligation to furnish the necessary information in this regard when submitting the approved copies of the certificate to the official of the state of destination.

Many states properly require quarantine and perhaps retesting on arrival of certain classes of livestock. Usually, the first and only notice a state official receives that an importation has been made is the receipt of the approved copy of the health certificate from the sanitary official of the state of origin. If this certificate is delayed through procrastination on the part of the veterinarian who issued it, the animals may have been shipped, received at destination, sold, and scattered to the four winds before the health certificate is received, making the quarantining or retesting highly inconvenient and expensive, if not impossible. Too often, the veterinarian fails entirely to furnish a copy for approval. This omission has even more serious results, as the sanitary officials of the state of destination never learn of many of such shipments.

In unusual circumstances, such as the appearance of an exotic virulent disease like foot-and-mouth disease, control officials should be authorized to place an immediate embargo upon all livestock and such other material or things as may convey infection originating in the area where the disease has appeared or is suspected and refuse to admit such animals or material into the state under any circumstances.

The federal government, through the Bureau of Animal Industry, has been of great assistance in the prevention of the interstate movement of diseased or exposed livestock or animals, the disease status of which is unknown, through the adoption and enforcement of regulations providing certain minimum health requirements for the movement of livestock interstate. This is as it should be. Disease is no respecter of state lines, and the jurisdiction of state officials can extend only to the boundaries of their respective states. In several respects, however, the federal government has not only failed, but refused to support state-control programs for reasons never satisfactorily explained. For instance, it is difficult to understand why the Post Office Department should be exempt from any obligation to comply with the state requirements in regard to importation of poultry. There seems to be no valid reason why conditions required of all other common carriers in the transportation of livestock should be ignored by the United States mail service.

The recent rapid spread of Newcastle disease [pneumoencephalitis] has resulted in the adoption by many states of regulations to prevent the importation of diseased or exposed birds or hatching eggs. These regulations will be largely ineffective as long as the Post Office Department continues to accept for shipment literally millions of baby chicks, poults, and hatching eggs without regard to the regulations of the state of destination.

It appears to this writer that the present policy is a serious infringement on the sovereignty of the several states who surely should have the right to protect the health and welfare of their people without interference of any federal agency. It is hoped that the present policy of the federal government in the handling of these products will be speedily corrected.

Another failure attributable to the federal government, perhaps more flagrant because perpetrated by an agency more closely related to the livestock industry is the lack of assistance to state agencies by the U. S. Bureau of Animal Industry in the control of importation of biological products containing active agents of communicable diseases. State officials are not asking assistance in controlling the use of these products within their respective state boundaries. They have, however, for years requested some measure to supply them with information as to the importation of the products above mentioned so that the control regulations within a state might be enforced. The U. S. Bureau of Animal Industry licenses the production and interstate shipment of biological products. Records and reports of many kinds are required of the manufacturers and dealers. It would seem to be a simple matter to require each manufacturer or dealer to report each interstate shipment of biological products for veterinary use to the livestock sanitary officials of the state of destination.

Livestock officials, through the United States Live Stock Sanitary Association, have requested the Bureau for years to establish such a requirement for manufacturers and dealers operating under license. Finally, on July 16, 1941, the U. S. Department of Agriculture adopted Amendment 15 to BAI Order 276 providing that, after Jan. 1, 1942, each interstate shipment of any veterinary biological product containing the active agents of any communicable disease of domestic animals must be reported to the chief livestock sanitary official of the state of destination. This was eminently satisfactory to state officials and appeared to be a long stride forward in our battle against disease; but wait for the rest of the story. On Dec. 24, 1941, a week before the order was to go into effect, before it had ever been tried, that group of producers of biological products who make their living, yes, their fortunes, by furnishing such products to be used without regard to the state laws or rules and regulations, were handed a Christmas present. Amendment 15 was revoked. No rational reason has been advanced for such action. Mr. Wickard, then Secretary of Agriculture, refused to meet with a committee of the U. S. Live Stock Sanitary Association who called upon him for an explanation and to urge reinstatement of the amendment. The assistant secretary to whom they were referred rather curtly informed the committee that the matter had been given full consideration and would not be reconsidered. Still no reasons given! A personal letter to the Secretary was referred to the same assistant for a reply and brought forth the same answer.

This amendment would have plugged a gaping hole in our otherwise fairly satisfactory interstate control of animal diseases. There is no fundamental difference between importation of disease organisms or viruses in, or on, the body of an animal and the introduction of the same organism or virus contained in a glass bottle. The action of the U. S. Department of Agriculture in revoking the order which would have gone far toward correcting this condition was probably the most severe setback ever suffered by the state livestock disease-control agencies of this country. The cancellation of this order requires control officials continually to contend with the hazard of disease caused by the improper use of these products.

Furthermore, some biological products, when used, cause reactions in animals which seriously interfere with diagnostic procedure and greatly hinder the control and eradication of the disease concerned unless the use of the product is carefully supervised and controlled. The federal government participates with various states in the payment of indemnity for animals condemned because they are affected with some such diseases. Failure to assist state officials in the control of the use of biological products affecting diagnosis of these diseases to the slight extent requested, and provided for in Amendment 15, appears to this writer as most inconsistent and ill-advised. Again it is hoped that this condition may be corrected before irreparable damage to disease-control programs has been perpetrated.

QUARANTINE

Quarantine of premises on which infected or exposed animals are maintained should be standard procedure and the first measure promptly applied as soon as a communicable disease appears or is suspected. It should not be deferred pending a positive diagnosis, if there are reasonable grounds to presume that it exists on the premises concerned. Quarantine, to be effective as a control measure, must be strictly enforced and must prohibit the movement from the quarantined area of any of the diseased animals, animals exposed thereto, or any article or thing which may convey infection. Quarantine properly enforced is a most effective weapon if continued until danger of infection is past.

It is hard for a layman to understand the necessity of restricting the movement of apparently healthy animals which have been quarantined because they are exposed to disease, or because they may still convey infection as carriers, even though apparently recovered. This failure to understand often results in loose observance and, coupled with the deliberate breaking of quarantine by persons who violate the regulations for mercenary reasons, makes enforcement difficult. There is also a tendency for some owners to fail to report a disease which they believe may exist for fear a quarantine may be established on the premises. It is this writer's belief that failure to report the existence of a communicable disease of livestock should be subject to

severe penalty. This applies to laymen, but more particularly to practicing veterinarians who should know and realize the importance of such reports.

Control officials of any experience realize that, while quarantines are usually observed when first established, familiarity apparently breeds contempt; and the longer it is necessary to maintain quarantines of individual premises or areas, the more frequent violations become. It is advisable, where possible, to move rapidly in a disease outbreak employing such other measures as are applicable to stamp out the disease so that quarantines may be promptly released.

DESTRUCTION AND DISPOSAL OF DISEASED AND EXPOSED ANIMALS

Destruction and proper disposal of carcasses of diseased and exposed animals is also a most effective means of stamping out disease. However, this measure is expensive. It is repulsive to livestock owners and the general public and should be avoided unless clearly indicated.

This method of control has its greatest value in combating a highly infectious disease of recent introduction which has not become firmly established in the territory involved. The classical example of slaughter as a method of control under the above conditions is the handling of foot-and-mouth disease in the United States. It also has been used successfully in eradicating contagious pleuropneumonia and fowl pest in the United States and hog cholera in Canada. In some states, notably Minnesota, this method has been eminently successful in the repeated eradication of rabies in spite of its frequent introduction from other states.

Efforts to eradicate a disease through slaughter of diseased and exposed animals must be pushed with vigor and dispatch if they are to be successful. Once this course is decided upon, ruthless destruction of all diseased and exposed animals must be effected. If there is only suspicion of exposure or diagnosis of the disease, slaughter still is indicated. If the process is delayed, awaiting confirmation of diagnosis or for other reasons, the results of previous slaughter may be nullified beyond repair. Half-way measures have no place in this plan of disease control.

Few informed persons question the propriety of the procedure followed in this country in eradicating foot-and-mouth disease on the several occasions when it has been introduced, although it is generally recognized that many animals have been destroyed which never would have become diseased had they remained alive.

Energy, foresight, careful planning, and courage are essential to this method of control, as well as laws and regulations that can be enforced. There are always objectors and, unless the program can be universally applied to all herds or flocks in the territory without fear or favor, the program is doomed to failure.

Destruction of diseased animals is properly used also in the control of certain chronic diseases, especially those which menace human health such as bovine tuberculosis and brucellosis. In the control of these diseases, this method has been widely accepted and has given favorable results even when used in a greatly modified form. It should be noted, however, that the farther we diverge from the principles above outlined governing destruction of diseased animals as a method of control, the slower is our progress and the less favorable the results.

When a policy of slaughter of diseased and exposed animals is undertaken, funds should be available for the payment of indemnity. Owners and veterinarians should not, however, gain the impression that a person is entitled to compensation simply because he is unfortunate enough to be the owner of an animal affected with some specific disease. Indemnity should be paid only if and when an owner sacrifices an animal for slaughter on orders of the disease-control authorities for the public welfare, and only when such animal, if retained by the owner, would have been a source of income, or which, if not condemned, might have been sold by him into other trade channels where the compensation would be greater than any salvage he might receive for the condemned animal. When such conditions are met, owners should receive indemnity to cover, at least partially, their sacrifice. The procedure for payment of indemnity should be made as simple and free from red tape as possible. Common sense should prevail in administering indemnity funds. Some of the detail now required could well be dispensed with, which would redound to the credit of control agencies. Simplifying and expediting

the payment of indemnity would encourage livestock owners to take advantage of programs set up for the control of such diseases as tuberculosis and brucellosis.

CLEANING AND DISINFECTING

Cleaning and disinfecting premises whereon communicable diseases of livestock have existed are of primary value when used in conjunction with other methods of control. All other methods fail if thorough cleaning and disinfecting are neglected. There is no object in destroying diseased animals or establishing a quarantine if the disease organisms are to remain undisturbed on the premises, to be carried in any number of ways to other premises or to reinfect healthy animals purchased as replacements for those which have died or have been destroyed on account of disease.

Cleaning and disinfecting are not spectacular. They represent hard work. The owner cannot see or even visualize the organisms or the virus he is seeking to destroy. Unless done under the supervision of a trained person, cleaning and disinfecting are bound to be neglected. Such neglect or failure may, and often does, undo all that has been accomplished by other control methods.

There is not space within the scope of this paper to discuss in detail methods and means of accomplishing disinfection, but any discussion of disease control would be incomplete if mention were not made of its importance.

ARTIFICIAL IMMUNIZATION

Artificial immunization of susceptible animals has value and wide application if used as an adjunct to other methods of control. In a few instances, due to our lack of knowledge of some of the fundamental characteristics of a disease, as is the case in equine encephalomyelitis, immunization must be depended upon as our principal weapon of defense. However, no disease of livestock has been eradicated from any territory of any size by means of immunization alone. When immunization is adopted as the principal or only measure of the control of any disease, it is an admission either that we have insufficient knowledge of the character of the disease to accomplish its elimination or to reduce its incidence to a minimum, or, that we lack sufficient wherewithal, perhaps including courage, to put such knowledge into effect.

Artificial immunization is popular with the layman. Used alone, it involves no restriction of livestock nor destruction of diseased or exposed animals, always a procedure detested by the owner. Many laymen feel that if immunization is used disinfection of premises, a bugbear to all owners of livestock, is unnecessary and may be dispensed with. The favorable and desirable features of immunization are constantly paraded before the layman by attractive advertisements and articles written sometimes with questionable motives and often by unqualified persons.

Artificial immunization is popular with the manufacturer and distributor. It offers an outlet for their products. Fortunes have been and are being made from the sale of these products.

Artificial immunization is popular with the practicing veterinarian. Again, it presents an opportunity for him to render his services for a fee. The immunizing procedure is easy, agreeable to the client, and all too often is used by the veterinarian without the exertion of even making an accurate diagnosis. All in all, artificial immunization is the easy, convenient, and desirable method of control of communicable diseases of livestock. The only fly in the ointment is that, alone, it does not work. It does not, cannot do, and never has done the job.

Please do not misunderstand me. Immunization where indicated, used in conjunction with other rational methods of disease control, is of great value and should be employed. It should be used when any factors necessary for eradication, such as the means of the spread of the disease, are not known or cannot be controlled. It should be employed, if means are available, where the causative agent cannot be destroyed by any means now at hand, as in the case of anthrax, blackleg, or tetanus, in areas where the soil has become infected. It is of great value in these circumstances in decreasing losses on the individual farm and in preventing active cases which may extend beyond the infected territory. If and when a disease has become so firmly established that economy dictates the disease must be lived with indefinitely, immunization is indicated, but if held out as a means of eradicating or controlling a

disease, vaccination alone is a delusion and a snare.

Unfortunately, in veterinary medicine many of the more efficient immunizing products contain living organisms or active viruses which, if improperly handled, may cause the very disease which they are supposed to prevent. Disaster may follow the use of such products when they come into the hands of unqualified persons. Even when handled by the most expert, the hazard is always present and, from time to time, new outbreaks of diseases are caused by their use. When it is decided to include immunization in the control program, it is the part of wisdom to choose a product for immunizing purposes that does not contain agents which may cause disease, if such a choice exists. In my opinion, any agency or authority advocating or allowing the administration of an immunizing product containing living organisms or an active virus is delinquent in its duty as a control agency if it does not first provide for adequate quarantine of the treated animals.

When used where indicated and in conjunction with other methods, artificial immunization is of great value. Many animals may be saved by its proper use, and outbreaks of disease may be more readily confined and eradicated if susceptible animals on surrounding premises are immunized. Proper immunization should be advised and urged wherever indicated and, under certain conditions, compulsory immunization might well be adopted.

However, artificial immunization often produces a false sense of security on the part of the owner of the immunized livestock, and also on the part of the control officials, resulting in a let-down in enforcement of other measures which allows further extension of the disease. This attitude must be guarded against and prevented at all hazards. If immunization is included in any control program, we must continually keep in mind that under no circumstances can diseases of domestic animals be satisfactorily controlled by immunization alone. No control authority is justified in allowing privileges by regulation or by special exception to animals which have been immunized. To do so invites disaster to any control program.

SUMMARY

The control of diseases of domestic animals requires prompt and energetic application of measures based on all available knowledge pertaining to the disease. Measures commonly employed, but varying in detail depending on the nature of the disease and the status of the area involved, are:

1) Exclusion of diseased animals.
2) Quarantine of infected premises.
3) Destruction and disposal of the diseased and exposed animals.
4) Cleaning and disinfection of premises.
5) Artificial immunization.

Success will follow if conditions allow the application of all measures enumerated and if they are intelligently and energetically applied. Application of one or more to the exclusion of others usually dooms the control program to failure.

International Grand Champion. — The DeBernard Cattle Company of Kremmling, Colo., ought to be mentioned in the JOURNAL for winning the hotly contested grand

—Credit American Hereford Journal

Royal H. Domino 43rd, International Grand Champion Hereford Bull.

championship with their 2-year-old Hereford at the International Live Stock Exposition at Chicago last December, against 44 Hereford breeders from 20 states, who showed 250 head in the breeding classes.

All phases of veterinary medicine are needed in public health programs, and all veterinarians must become active in them. *—Dr. E. J. McLachlan, Jackson, Mich.*

Cows develop immunity to rabies quickly. Rabies vaccine may be administered at the rate of 100 cc. the first day, 50 cc. the second day, and 50 cc. the third day.

Sanitary Problems in Connection with Army Fish Inspections

COLONEL JESSE D. DERRICK, V.C.
Boston, Massachusetts

ANNUAL wartime procurement of fish in the New England area approximated 21,000,000 lb. of frozen fish fillets. It represented over 53,500,000 lb. of round fish and about 75 per cent of the amounts purchased for the armed forces. Inspection included processing, packaging, refrigerated storage, and shipping.

Prior to the award of contracts, a detailed inspection of establishments was made. An approved list, including the Boston Quartermaster Depot operations in metropolitan Boston, is published quarterly by the First Army Area veterinarian. Basic standards similar to those for other food establishments, including health of employees, sanitary facilities, and practices, are required.

Sanitary standards in the fish industry leave much to be desired. It has been my good fortune to be invited to the meetings of the northeastern section of the Institute of Food Technologists. Leading men like Mr. Clarence Birdseye are aware of these conditions and are anxious to correct them. They deplore such practices as forking fish. However, for various reasons they must proceed slowly. Recently, a few plants have been equipped with hoists completely eliminating the use of forks. In other establishments, fish are still forked four or five times during processing. Each fork tine that pierces a fish introduces contamination. Other conditions require correction, such as the use of dirty, wooden barrels in which the brine is rarely iced or replaced. Filthy nets for transferring the fillets from primitive filleting tables to dirty packing tables from which the brine does not drain are still in use. The managements of such establishments usually are not particular about the quality of fish, whether they are carefully washed prior to filleting or are promptly packed and placed in the freezer, or how soon they are frozen. A day highway worker was employed at three plants to clean up at night. All three were filthy. I suggested that they reverse the procedure; namely, to hire the man to clean the plants during the day and spend his leisure hours on the highway. Such establishments are not safe and have been removed from the army approved list. Highly undesirable conditions still exist in many plants. Therefore, fish cannot be safely procured from other than approved sources.

Cleaning and Sterilization.—In some instances, unpotable water from around the piers is used for cleaning. Such practices cannot be approved. Sea water may be used where the intake is in a clean area; such water is satisfactory for the initial cleanup of floors. Potable water, however, must be used for washing all essential equipment. The cleaning of filleting tables, conveyors, pans, and brine equipment must be done thoroughly. Steam and hot water are highly desirable.

Chlorinated water, formaldehyde six (6) parts per hundred, and 0.2 per cent sodium nitrite solution have been used to sterilize boats and essential plant equipment after cleaning and prior to the day's operation.

More highly qualified technical men are needed to work with the industry. The Food and Drug Administration is most efficient but does not have sufficient authority. An agency like the Meat Inspection Division, USDA, with power to tag condemned lots is urgently needed.

In one of our Boston plants, it was reported that two men sickened and one died from Weil's disease which is transmitted through the urine of rats; hence, the importance of inspecting for evidence of contamination by rats and of rodent control.

INSPECTION OF FISH

Inspection of fish requires keen observation and considerable experience. Inspectors should be well informed. Their knowledge can be increased by intimate contact with the trade, the Pure Food and Drug Administration, federal and state health departments, wildlife, and other agencies, and the study of literature which, unfortunately, is very limited. It should be kept in mind that there is a marked difference in

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prime fish, whether fresh or frozen, and those that are barely edible. Defrosted fish have a grayish, leached, lusterless appearance. The skin frequently is rough, indicating approaching staleness. They spoil easily and therefore are not acceptable for filleting. There is only one acceptable grade, namely, "strictly fresh." In order to obtain fish of the best quality, they must be under supervision from the time they leave the boat until the packaged fillets are completely frozen and properly stored, at which time they are accepted and stamped. The job is not completed, however, until the fish are served to GI Joe in acceptable condition. Consequently, supervision must be continuous, and daily records of storage and loading temperatures are necessary. Fluctuations of temperatures, digressions from standard refrigerated warehouses, and shipping procedures must be corrected promptly to avoid damage and spoilage.

Consideration is given to the sanitary condition of the boat as well as to the age, icing, and condition of the fish. There should be a layer of ice on the bottom, along the sides, and on top. Refrigerated holds are the solution; however, very few fishing boats are so equipped. The larger boats may be out as much as ten days. The first catch naturally goes into the bottom of the bins and, as other catches are added, pressure is increased on the bottom layers. Shifting due to heavy seas, especially in the absence of sufficient ice, results in serious softening and mechanical damage. This is greatly decreased by shelves or "pen boards" placed horizontally at intervals to lessen the weight on the bottom layers. Likewise, adequate insulation to improve the refrigeration and good sanitation aid in preserving the quality. Internal temperatures should not exceed 45 F. Frequently, only top layers free from damage and representing the more recent catches are accepted.

Fish, being cold-blooded animals, have a temperature but little higher than the water from which they are taken and usually are colder when caught than the surrounding air. Thorough washing, gutting, and removal of the gills retard putrefaction. Icing limits and freezing stops it.

The handling from the boat to the filleting tables is carefully supervised. Baskets, carts, and scalers must be kept clean, and there must be no unnecessary delay, especially in warm weather. Fish must arrive on the filleting table carefully washed, clean, and in a well-chilled condition; however, if they are shipped whole the natural slime which acts as a preservative is not removed, and heads are left on to prevent exposure of flesh to contamination and bacterial invasion. Gills, the first part of a fish to spoil, should be removed.

CONDITIONS FOUND IN FISH

Rigor Mortis.—This is the first change that takes place in fish and is a sign of freshness and wholesomeness. The warmer the fish is when caught, the sooner *rigor mortis* will set in and the shorter will be its duration; the colder the fish, the more delayed will be the *rigor mortis* and the longer will it last.

Autolysis or Self-digestion.—This is due to enzymic action; though highly desirable in meats, it is equally undesirable in fish causing them to become soft and flabby. This process is hastened by warmth, retarded by cold, and prevented by freezing but begins as soon as fish are thawed. It is greater in slow-frozen than in quickly frozen fish.

Fish may be classified as fresh, stale, or putrid, depending upon their degree of freshness. Fresh fish have a bright appearance or bloom; the scales are firmly adherent and glistening; slime, if present, is that natural to the species, is transparent, and covers the body surface; the eyes are bright without opacity, plump and full; the gills have a bright red color and no unpleasant odor. Gill covers and mouth are closed; the abdominal walls are firm, elastic, with no evidence of bloating or discoloration. The flesh is adherent to the bones. Discoloration and softness due to the intestines not being promptly removed or to poor refrigeration is not permissible. The blood in the abdomen is bright; there is a fresh, characteristic smell; when laid across the hand the fish does not bend; and it sinks in water. Fresh fish should be free from "pugh"* marks caused by piercing with fork tines, and from water marks as indicated by a reddish tinge on the skin seen close to spawning season. Fresh fish represents the finest in quality, flavor, palatability, and desirability.

*The pugh is a long-handled, hooked prong used for pitching fish.

Stale fish, while yet edible, may become putrid before they can reach the mess hall and are deficient in appeal. Putrid fish are inedible.

HANDLING AND INSPECTION

Ice is used universally for the preservation of fresh fish. Its liberal use retards bacterial growth and, thus, preserves the fish in a fresh condition for a short time. However, fish will autolyze in ice as fast as meat does at 70 F. Best results are obtained when the ice is shaved or chiseled, rather than broken, as the fine ice contacts the fish more intimately causing less bruising and better refrigeration. Fish keep best when packed as soon as caught, in such a manner that the temperature will not rise above 40 to 45 F. They must be handled carefully to prevent bruising. Under this condition, fish will keep in good condition for two weeks or more. Deterioration is evidenced in direct proportion to the delay in initial icing, failure to maintain a low temperature, and any unnecessary exposure to the sun, hot air, contamination, and off odors. About 50 lb. of ice are required for icing a box of 100 lb. of fish in warm weather, greater or less quantities being needed as the size and construction of the boxes and the temperature varies. Renewal of ice as it melts and draining the resulting water are imperative. Soaking rapidly decreases palatability and keeping qualities.

Upon arrival of the boats at the docks, the fish are inspected for condition. They are taken from the boats by a group of men called "lumpers." These men fork the fish into large canvas baskets which are hoisted to the wharf for weighing and inspection by the buyers for condition and quality. The fish may go from here through one of three channels: (1) to the scaler for immediate processing, (2) to the holding bin where they are iced for future processing, or (3) sold fresh. Fish to be filleted are put through a mechanical scaler. The scales are removed. They are thoroughly washed and conveyed to the cutting table where they are filleted and the gurry† disposed of. All tables and equipment which come in contact with fillets should be sterilized at the beginning of the day's operation. Particular attention should be paid to evidence of rat or other contamination. Filleting tables should be cleaned at noon and at the end of the day's work. The temperature of the filleting room should be maintained at about 50 to 60 F. Conveyors of approved design are preferable to manual methods.

†The offal of fish.

HANDLING OF FILLETS

In this area, red fish or ocean perch fillets are candled for parasites; all fillets are checked for bruises, blood clots, "pugh" marks, fins, and napes. The nape is the anterior abdominal wall and is the first portion of the fillet to spoil. Army fish are usually bought napeless. From the filleting table brine flumes, conveyors, or manual methods are used to carry the fillets into a brine solution varying from 10 to 30 degrees salometer strength, at 30 to 40 F. Temperature is maintained by ice or preferably by artificial refrigeration. Circulation is highly desirable. The purpose of the brine is to clean the fillets thoroughly, although it may act as a slight preservative and it lessens or prevents leakage on defrosting. Ultraviolet lights immersed in the brine have a bactericidal effect. Brine must be changed as often as necessary to keep it fresh and clean. Excess brine retards freezing and constitutes an adulteration. It indicates that the fish were not fresh when processed and that the brine was used as a preservative.

Fillets should be examined carefully at time of packing for size, freshness, temperature, bilgy odor, parasites, contamination, discoloration, staleness, putrefaction, and for excess or dirty brine. Containers must be suitable. Occasional checks of every fillet in a box are made at time of processing. A comparison of good and off-condition fillets follows.

Characteristics of Good Fillets.—(1) Blood along backbone is clear and odorless; (2) insides of napes and belly walls should be clear and bright; (3) fresh fish or fillets should be firm, bright, and have a fresh odor. Sounds and blood along backbone should be completely removed; (4) in round dressed fish, the flesh is firmly attached to bones.

Characteristics of Off-Condition Fillets.—(1) Blood along backbone is dark and has bad odor; (2) insides of napes and belly walls bruised or turned a brownish color; (3) flesh is soft and flabby and has sour odor. This condition is more common in bottom layers. Sounds and blood are not completely removed; (4) auto-

lysis is setting in. The flesh is no longer firmly attached to the bones.

PARASITES FOUND IN FISH

Many types of worms are found in the flesh of fish, some varieties having more than others. The amount of parasitization also depends on the season of the year and the locality from which the fish originate. There is very little danger that parasites found in fish will live or cause infestation in the human body.

Where worms are present in sufficient numbers to render the fish repellent as an article of food, the product is rejected.

WRAPPING AND PACKAGING

The fillets are taken from the brine tanks, preferably by conveyor, and drained before packing. The generally used styles of packing are as follows:

1) *Layer Pack.*—The fillets are placed in layers in a paper-lined box, parchment paper separating each layer.

2) *Parchment Wrap.* — The fillets are divided into about ten equal portions and each portion is individually wrapped in a vegetable parchment paper. These packages are placed in box containers.

3) *Cello Wrap.*—This is same as parchment with the exception that cellophane paper is used.

4) *Tin or Lacquered Containers.*—Fresh orders are packed in 10- or 20-lb. tin or lacquered containers which are then placed in self-draining, wooden boxes and well iced. Water must never be permitted to enter the containers.

The most common method used for the Army is layer pack. The outside container usually is a wood box, paraffined, or waxed fiber carton having a net weight capacity of 10, 15, or 20 lb.

Packaged fillets for the freezer should be held in a clean room, free from odor and away from the offal barrels at a temperature of between 30 F. and 40 F.

The inspectors in the filleting plants fill out a ticket which is sent with each shipment of fish to the freezer where the inspector makes spot checks for condition. At the end of the day, he checks his tally count against that of the inspectors in the various plants to determine the exact production and detect delays.

INITIAL FREEZING

The packaged fillets are usually placed in the freezer within one hour, and the time should never exceed five. Initial freezing should be handled by one of the following methods:

1) Freezing rooms 0 F. or lower with or without fans. Boxes must be well separated. This is the least satisfactory method.

2) Blast room at —30 to —40 F. Packages are separated on racks or passed through tunnels on conveyors. Heavy duty fans are used to circulate the air. This method is efficient if freezing is complete before boxes are removed.

3) Single layers in direct contact with refrigerated pipes. This method is satisfactory if the pipes are not too heavily coated with ice.

4) Plate method—the "Birdseye process." The boxed fillets are contacted above and below under pressure by hollow plates for the direct expansion of ammonia or circulation of brine. Freezing time approximates one hour for each inch of thickness. This is the most desirable method and produces a carton of uniform size and shape thereby facilitating storage. Contents must be frozen solid in thirty-six hours. Hammers and ice picks are useful in checking boxes to determine if they are solidly frozen. Fillets which have been slowly frozen are glazed with ice, and there may be an accumulation of ice formed by excess brine or dripping of moisture from the cell structure. Careful handling of boxes is stressed to avoid damage.

A class 4 inspection is then made and the fish are placed in storage at 0 to —10 F. Next to the selection of fresh fish, prompt and complete freezing is the most important processing step. Arrangement is most important. Two-inch dunnage, 4- to 6-inch wall space, and at least 18 inches of ceiling space is required. Excessive fluctuations of humidity or temperature are reported to the purchasing agency and to the warehouse management for correction. In one instance, damage for inedible fish amounted to $8,000 and this was charged to the freezer. Undesirable changes in frozen fish are listed below.

1) Dehydration, or "freezer burn," is the loss of cell moisture due to slow freezing, insufficient wrapping, exposure to air of low humidity, and excessively low storage temperatures. It occurs on the exposed surfaces causing a grayish opaque appearance.

Dehydrated fish are of lower quality due to cell damage. They are dry, tough, and unpalatable.

2) Discoloration due to oxidation or decomposition of the pigments of the blood upon exposure to the air produces a brownish discoloration of the flesh. This is particularly noticeable near large blood vessels, underneath the backbone, and in the belly walls.

3) Rusting is due to oxidation or hydroxylation of the fat. This is manifested by accumulations of a gummy character and a yellowish, rusty color on the surface of the fish particularly near the base of the fins and in the belly cavity of gutted fish. It occurs at temperatures above 8 F.

4) Loss of flavory substances is due to evaporation of volatile substances other than moisture, to enzymic changes through the action of oxygen of the air, and consequent oxidative rancidity or losses occurring in defrosting.

5) Acquisition of undesirable odors and flavors is due to exposure or contact with odors or odorous materials.

CARE OF FROZEN FISH

All frozen fish is examined carefully on arrival or at time of initial inspection to see that it is in prime condition, every thirty days while in storage (class 9), and at time of shipping (class 6).

Frozen fish should be kept solidly frozen until used. Under proper conditions, they can be held in storage for five or six months without impairing the eating qualities, al-

St. Bernards Travel by Air

Prize winning St. Bernards and their owners fly to the Pacific Coast St. Bernard Dog Show. The value of the 18 purebreds on this flight was placed at $100,000.

though it is the general practice not to hold them longer than a maximum period of three or four months. Whenever necessary to hold frozen fish in storage, care must be exercised in seeing that they are properly protected against dehydration, off odors, and contamination.

In defrosting the fillets, they should not be allowed to stand in contact with water, but should be placed so that moisture drains easily. They should never be placed in warm or hot water to hasten the thawing process. Frozen fish should be permitted to thaw at about 40 F., kept well refrigerated, and used promptly. Three points to keep in mind are: (1) freezing does not improve the quality of fish. (2) Fish should not be thawed out and refrozen as deterioration and loss of quality results. Once frozen, they must be kept at 0 F. or lower until used. (3) Rapidity of spoilage after defrosting is in direct relation to sanitation, manner of handling, and time elapsing before freezing and after thawing.

The Pure Food and Drug Administration maintains that food is adulterated if prepared or packed in such a manner as to be contaminated with filth or rendered unfit for human consumption. Adulterated foods are subject to seizure if shipped interstate, the shipper being subject to three years imprisonment or a $10,000 fine. Putrid, decomposed, and insanitary have a common implied meaning. Misbehavior of personnel, unsuitable raw materials, presence of rats, hairs, pellets, insects, flies, fish parasites, and mice filth are considered under sanitation. Acts of commission or omission contribute to insanitation.

Inspection of frozen fish is difficult. It requires experience, diligence, and patience. A suitable place, clean, free from odors, and with good light, must be found to temper 5 per cent of the packages enough to make separation of the fillets possible. Under emergency conditions, fish may be removed from cartons and placed in clean water to hasten the tempering process. However, the former method is more efficient. The general appearance of the mass is observed for excess glazing or moisture, the cleanliness of same, and any evidence of undesirable changes. Individual fillets are broken and quickly placed close to the nose to determine the odor. If normal, the fillet is fresh. Inspectors must become familiar with the normal odor of the various species. However, various undesirable conditions such as staleness, bilginess, discoloration, gassiness, and putrefaction may be found. The latter is indicated by a pungent, sweetish, sickening odor. Each fillet in the package should be examined in this manner and the results tabulated. Complete defrosting may be of help in making a final decision. One or two bilgy (from bilge water) and one or two stale fillets per package are permissible. However, there is no tolerance for gassy or putrid fish.

There is no emergency so urgent which justifies the purchase or shipping of frozen fish without a thorough examination. If there isn't sufficient time or help to do it thoroughly, no inspection should be made and the receiving agency so advised.

Shipments are made in clean refrigerator cars or trucks well iced or equipped with mechanical refrigeration, with an opening temperature of not over 28 F. Doors should be heavily papered in hot weather.

Fish inspection must be efficient and exact. There can be no compromise, and supervision must occur from the time the fish leave the boat until they reach destination. It is a good food if handled and prepared properly. However, if procured from unreliable sources, it can be most unappetizing and may be extremely dangerous. Loss of fish inspected in this area (Gloucester) due to spoilage has been negligible. One million pounds have been inspected and not a pound found unfit. This record has been made possible through the loyalty of officer, enlisted, and civilian personnel who, by experience and application, have qualified themselves for this important veterinary inspection activity.

Pneumonia Vaccine

A pneumonia vaccine developed by bacteriologists of Columbia and New York universities, with the prospect of mass vaccination against lobar pneumonia, is the subject of a recent release to the secular press. Commercial production by E. R. Squibb & Sons is announced for early spring.

The vaccine was perfected under a grant from the Surgeon General of the Army, the press reports declare. Its usefulness is limited to the lobar type of pneumonia, the mortality of which, before the coming of sulfonamide therapy, was about 25 per cent.

Historical Sketches and Memoirs

III. The General Practitioner

(Continued from January Journal)

L. A. MERILLAT

Chicago, Illinois

18.

Animal Dentistry

The wise practitioner habitually points out the advantage of dentistry. In the large herbivores, the teeth are the least dispensable of the organs strewn along the canal of alimentation. Timeworn as that line of chatter is, nothing can ever change it. Coarse forage, the only kind this group of Ungulata eat, has to be reduced to digestible pulp *in the mouth,* and I guess that's the way it's going to be for each graduating class in the foreseeable future. Moreover, in harness and riding horses, the mouth is the hub of the steering wheel; there is a tactile sense to be preserved against irritation and abrasion. The competent horseman, the jockey, the whip, and equestrian, want the diastema, cheeks, and buccal commissures protected by dental work. The veterinarians of the nineteenth century seized upon this truth more avidly than their successors, some of whom I've questioned for licensure, who had never thought of the horse's mouth in that particular rôle. Anyhow, it didn't get into their notebooks. But, there is a reason for every quirk and every qualm.

Because equine dentistry came into the modern educational system from nondiplomatized dentists, some itinerant and some residential, the art was unwisely ridiculed as a fake by the tycoons of the realm, even to the extreme of slighting entirely the business end of the digestive tract. Passing over the process of prehension, mastication, and insalivation, processes accomplished by a complex mechanism bearing intimate relations to olfaction, gustation, respiration, and deglutition, was amusement to the professors in long coats and silk hats. Dentistry was the job of the assistant or freshman student. Here's a tale told for the first time. The lamented Andrew Smith, founder and principal of my *alma mater,* was unusually cynical about horse dentistry and was especially so toward one Doc McPherson, swanky Toronto horse dentist who spirited senior students down the alley to teach the art of floating teeth at so much per matriculant. Not having the price of the tuition, I was not one of them, cross my heart. But the crux is this, and what a crux! Capable Charley Wise, trainer of Professor Smith's little string of Thoroughbreds out at the Woodbine track, used to have Doc McPherson out to the track in the misty dawn to "fix the teeth" of the Professor's fast ones. Here was an early example of split opinions about horse dentistry. In fact, dentistry was a part of horse training. I am told that few Thoroughbreds now escape the "dental chair," although in the lecture room horse dentistry never got a break. And here is the reason, take it or leave it. One has to learn equine dentistry by practice to keep from making a holy show of oneself.

After practicing dentistry on a large scale among the better class of horses, it soon became apparent that the professors were too far wrong to be taken seriously. The four rows of pointed enamel at the business end of the longitudinal ridges of overworked molars may be laughed off in the lecture room but not in the stable of the capable horseman. What the teachers belittle the horsemen praise to high heaven. Nevertheless, the teachers won in the veterinary profession. They talked dentistry into the lowly art, as the physicians once did within the memory of living men. Of course, you know the history of the barber pole. Horse dentistry was talked into the hands of the professional horse dentists few of whom were D.V.M.'s then or now —that is to say into hands more skilled in the handling of a horse's mouth. Owing to total lack of experience, nothing will be entered here on bovine dentistry. Odontopathy of the ranch and byre has to be skipped in these sketches.

19.

Strategy of the Dental Art

The human dentist working with frightened children might get a hunch from the horse dentist and his emotional Thoroughbreds. There is a baffling artistry in horse dentistry that few realize or attempt to master. The veterinary dental op-

eration of the present day is forced upon the patient with heavy hands and strong instruments. It is comparable to the human dentist forcing his technique upon a cringing child in lieu of the finer strategy of his art. He doesn't pry the mouth open with an iron apparatus to lift out a shedding cap. Successfully executed horse dentistry is a matter of knowing how to appease the patient. That is what the professional equine dentist has and the general practitioner hasn't—as a rule. There is something marvelous about going into the stall of a temperamental plater and having him actually enjoy the strokes of the file, or passing the unaided hand to every niche of the mouth without opposition. These are the untaught details of this extra-curricular branch of veterinary medicine.

The archaic contention that the sharp points on the molar dentures of horses and cattle are normal fails to account for the volume of harsh forage these animals have to reduce to the consistency of pulp in the course of their artificial lives, nor does the modern general practitioner study the horse over-rigged with snaffles, curbs, chains, bridoons, check reins, martingales, etc., which call for well-rounded premolars. All of such details of current zoötechnics are set aside for the more valiant teachings of sanguinary surgery.

Already in the 1860's, there were skilful residential and traveling horse dentists whose services were sought avidly by the upper brackets of the equine orbit—stock farms, race tracks, training stables, riding schools, horse shows, army—but not having garnered the quick-earned diplomas of their time, they were vocally smeared in places where their work could neither be duplicated nor their growing popularity stopped. Horse dentists have been too skilful to beat and too popular to put out of business. They still flourish where general practitioners haven't captured the idea I am trying to point out.

20.

Some Famous Horse Dentists

In touching the subject of dentistry, stomatology, and rhinology which are quite inseparable, mention of C. D. House of New York is inescapable. He flourished in the 1860's, 1870's, and early 1880's and was succeeded by his son who died a young man.

General U. S. Grant, himself a famed horseman, gave horse dentistry its greatest lift when, as President of the United States, he obtained a congressional appropriation to pay House for dental work among the horses of the Army 'way out to the remotest outposts. Among his clients were the best people of New York, Philadelphia, Pittsburgh, Cleveland, and Chicago, and the breeding farms throughout eastern and central United States. He was by far the best-known veterinarian in the United States barring none, though he practiced only dentistry. William B. Craig, who was conducting a busy horse dental parlor at 16th Street and Michigan Boulevard when I joined the McKillip staff around the corner on Wabash Avenue in 1888, was one of his (House's) students. Craig's death in 1890 changed my whole professional career. It made me a horse dentist. Craig's establishment was a well-patronized, money-making place. The waiting rooms (hitching posts) were always crowded with patients. Veterinarians treated the sick and Craig took care of the teeth for the better class of horse owners. The patients were turned out at a terriffic rate at $3.00 a head, which wasn't hay in the 1880's. Veterinarians were making calls for $1.50. So, when Craig was gone, there was a scramble for his trade. Among the scramblers was the keen business getter, M. H. McKillip, who forthwith made me the official dentist of his staff, and that was my rating (in Chicago) for the next ten years. With Craig out of the way, it was like taking candy from the baby. All there was to do was to noise around that "We've got a man to look after the teeth." That man was "me." "Send out the dentist," became a common telephone call, and the rest of the staff passed the good word along. I have often wondered whether we made a mistake by lowering dental jobs to $2.00. McKillip doted on volume* and got it.

Although, praised as an expert dentist, I lost caste as a doctor and I didn't like it. In fact, that was the main reason for leaving McKillip to accept the chair of surgery

*The famous McKillip practice was built up on the policy of a uniform charge for calls regardless of distance within the city, like a department store that keeps business down town by delivering a spool of thread anywhere without extra cost. That policy, clocked like the fire department, was tough on the local boys. When a local practitioner went a block or two to treat his groceryman's horse and charged $1.50 he was often reminded in anger that McKillip came all the way from down town for that.

at the Chicago Veterinary College in 1901; I had failed to uplift the dental art to the level of respectability.

Floating teeth and punching out molars soon had me writing articles, papers, books on the dental art: "Veterinary Dentistry," 1896; "A Few Words anent Wolf Teeth," 1898; "Animal Dentistry and Stomatology," 1901; and sundry notes which were just so many efforts (in vain) to make dentistry an acceptable specialty in college and practice. The failure goes to show that changing the habits of a profession is not a one-man job. Anyhow, dentistry lost ground to the more lofty art of taking afterbirths. So, I left it to wither from its unpopularity, and handed it back to the specialists where it now rests, waiting for another champion who may never come.

(Part III, The General Practitioner, to be continued next month.)

Rabies Control a Humane Activity

Is man the dog's best friend? This question, asked by Dr. A. Zeissig in *National Humane Review* (October, 1946), is answered by Dr. Zeissig with a description of a rabid dog doomed to death because the owner had failed to prevent the incurable infection.

After a concise outline of rabies in its two forms, he discusses the measures which we must take if we are to be successful in eradicating the disease. The measures are determined by the disease,—"it lays down the rules and we must abide by them."

Three things must be done to prevent dissemination of rabies: incarceration of the animal showing symptoms resembling those of rabies; proper management of the animal known to have been bitten by a rabid animal; and control of all dogs by their owners when rabies is present in the neighborhood. The first is self explanatory, the second means reporting of the incident and proper confinement of the bitten animal. The third is the subject of much discussion and disagreement.

The urban dog is under control only when on leash. Muzzling is not necessary. Because human nature is such that it will not be possible to keep all dogs on leash, secondary steps become necessary. Vaccination stands first in this group, largely because of the dependability of the modern, Habel-tested vaccine. Even now the vaccine is not perfect, but by subjecting each lot to the mouse test a high degree of uniformity has been achieved.

In order to make man the dog's best friend, it has been found that a county rabies advisory council inspires public confidence in control measures and encourages widespread participation in the program which is designed primarily to protect each individual pet against possible exposure to this dread disease. In addition to a chairman with official responsibility for rabies control, the suggested council should consist of a town health officer, a veterinarian, a dog warden or person responsible for dog control, two dog owners, a member of the board of supervisors, a representative of farm organizations, and the county sheriff.

Penicillin Ineffective in Rabies

Rabies was added to the other neurotropic virus infections (St. Louis encephalitis, poliomyelitis, equine encephalomyelitis, and nervous distemper of dogs) which do not respond to penicillin. Dogs and rabbits inoculated with 1 per cent emulsion of both fixed and street virus, which had been treated *in vitro* with 5,000 Oxford units of penicillin, died after the usual period of incubation and illness. *In vivo*, the results were essentially the same. Two rabbits of 1.75 kg. and 1 untreated control died in seven to eight days from 0.5-cc. doses of the virus emulsion, in spite of receiving 5,000 or 10,000 Oxford units every three hours day and night, intramuscularly. — *Condensed from Arch. Inst. Pasteur d'Algerie, 24, (March, 1946): 29-31.*

DDT Discovered Years Ago.—Dichlorodiphenyl-trichloroethane, the now familiar DDT, was discovered in 1874 by a Swiss chemical student, Othmar Zeidler. His formula was overlooked until 1939 when the Swiss Government used it to fight a plague of potato bugs, and later released it to the U. S. Army Medical Corps which developed it as the most effective weapon against typhus and other insect-borne plagues.

Cows develop rabies rapidly. If bitten on the muzzle, many will be rabid in three weeks.

Surgical Removal of the Mammary Gland of the Bitch

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THE MAMMARY glands of the bitch (5 years and over) are a common site for tumorous growths. The incidence is high since 30.8 per cent of all tumors studied at the Small Animal Clinic, Des Moines, Iowa, were of mammary origin.

In a seven-year period (1939 to 1946), 123 breast tumors were removed from 67 patients. In 26 cases, there were multiple breast involvements and in 41 cases, the lesions were single. It is estimated from the hospital records that this number of neoplasms were found in approximately 3,000 nonspayed females over 5 years old.

The clinical importance of this can be appreciated, for, if these tumors are left undisturbed many become unsightly, ulcerating masses, or if they are malignant, they metastasize to other organs and cause death. Therefore, early adequate treatment is necessary.

The successful handling of this problem presents many complicated factors. First, since most of these tumors are malignant and will metastasize, satisfactory treatment is not always possible. Second, the mammary glands are so closely associated, functionally, with the genital organs that their behavior depends upon endocrine production. Third, the relation of the gland to lymph drainage and blood supply must be studied and the tumors removed accordingly to prevent recurrence. Fourth, mammectomy is a major operation and cannot be accomplished without risk to the patient.

Position and Nature of the Growth.—The successful removal of the affected gland involves many factors. These include a complete understanding of the nature of the growth, anatomic position as related to lymph drainage and blood supply, and physiology as related to the estrous cycle and endocrine influence.

Before recommending a surgical approach, the tumors must be evaluated by a satisfactory histopathologic diagnosis and classification. Only by this means can the true significance of the pathology involved be established. Such a standard is not available in veterinary medicine, although such material is at hand for assistance.

In human medicine, a classification of mammary neoplasms has been well standardized, but the problem is somewhat different in veterinary medicine, both macroscopically and microscopically. There are variations in the number of glands, the blood and lymph supply, the cycle of reproduction, the age of sexual maturity, and the life expectancy.

The histopathology of the canine neoplasm varies somewhat from that of man in that there is a striking difference in the increase of the connective tissue elements. Even in the adenocarcinoma, connective tissue proliferation is prominent. Many mammary tumors of the bitch are of the mixed variety containing cartilage, bone, and mucous tissue, as well as epithelium and connective tissue.

A modification of the Moore[1] classification for tumors in man would be the most satisfactory in analyzing mammary tumors of the bitch, when all factors are considered.

Grading of carcinomas by the Broder method[2] is useful in determining the degree of malignancy. Grade 1 denotes 25 per cent replacement of the normal glandular structure by malignant cells. Grade 2 indicates 50 per cent invasion. Grade 3 is 75 per cent, and grade 4 is total replacement of the normal cellular elements. The presence of mitotic figures in large numbers specifies acceleration and invasiveness of the process. Broder[2] believes that a tumor establishes a growth pattern early which it maintains throughout existence; *i.e.*, a specific tumor will retain its morphologic structure after metastasis and invasion of new tissue.

1) BENIGN FORMS

A) Normal Lactating Breast.

B) Lactating Breast of Pseudo-pregnancy.

C) Mazoplasia.—Hyperplasia of the breast epithelium in a nonlactating bitch, characterized by the presence of large numbers of acini

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in the area of the alveoli ducts. Acini in numbers are only rarely found in the nonlactating breast.

D) Chronic Interstitial Mastitis.—A diffuse productive inflammation, with a new growth of connective tissue about the ducts, lobules, and acini. The tissue may be richly infiltrated with plasma cells and a few polymorphonuclear leucocytes.

E) Fibrocystic Mastitis (fibrocystic disease).—Marked by production of many small cysts, considerable epithelial proliferation, and profuse connective tissue growth. The cicatricial growth plugs the ducts by stenosis, favoring cyst formation; the cysts are filled with acidophilic-staining material in the lumen in the ducts and acini. The interacinar tissue is very cellular, and lymphocytes and plasma cells are often present.

F) Intraductal Epithelial Hyperplasia and Papilloma.—A pronounced overgrowth into the ducts of large epithelial cells with hyperchromic nuclei. It is not uncommon to see epithelium-covered papillomas projecting into the lumen by means of connective tissue stalks. If these proliferating cells show a tendency to invade the wall they should be considered precancerous.

G) Fibro-adenoma.—(1) Cystic pericanalicular fibro-adenoma.—Usually a firm solid encapsulated tumor with broad bands of connective tissue surrounding the interlobular spaces and ducts. The connective tissue growth is so profuse that the secretions of the acini and the ducts are trapped and cysts form. The cysts are lined by cuboidal epithelium. (2) Intracanalicular fibro-adenoma.—A tumor producing an overgrowth of connective tissue which completely fills the alveolar and ductal spaces.

2) MALIGNANT FORMS

A) Pure Epithelial Canalicular Adenocarcinoma.—(1) Simple type (invading multiple intraductal papilloma). (2) Acute type (painful red skin, rapid growth). (3) Mucinous type (dilated ducts, cysts filled with mucin and surrounded by neoplastic cells). (4) Carcinoma *in situ* (congeries of neoplastic cells filling the lumens in a lobule. Such a growth is confined to a single area). (5) Epidermoid carcinoma (metaplasia or prosoplasia of duct epithelium to squamous cells).

B) Mixed Tissue Malignant Tumor.—(1) Fibro-adenocarcinoma. (2) Chondrofibro-adenocarcinoma. (3) Myxochondrofibro-adenocarcinoma. (4) Myxo-osteochondrofibro-adenocarcinoma.

C) Pure Connective Tissue Canalicular Sarcoma.—(1) Adenosarcoma.

3) TUMORS OF THE SKIN AND BREAST

A) Benign and Malignant Forms.—(1) Melanoma. (2) Steatoma (sebaceous adenoma). (3) Lymphoblastoma (transmissible of Feldman). (4) Squamous cell carcinoma. (5) Basal cell carcinoma. (6) Sweat gland adenoma (Paget's disease) of nipple area. (7) Sweat gland carcinoma (Paget's disease) of nipple area. (8) Granuloma of nipple. (9) Hemangioma.

On this basis, our series of 123 tumors from 67 patients have been classified as to type, distribution, number, and age of the patient.

DISCUSSION

The data at hand indicate that, in the series, age has a definite influence on the occurrence of mammary growths. The average age was 8.54 years. With one exception, all breast tumors were from bitches over 5 years of age. The one exception was a Great Dane 1 year old that developed a fibro-adenoma in three breasts following pseudo-pregnancy. Tumors were most nu-

Table I—Summary of Tumor Cases

Type	Cases	Breasts: Location* 1	2	3	4	5	Total involved	Age (yr.): Range	Av.
Pseudo-pregnancy	1[a]	0	0	0	1	0	1		7
Chronic interstitial mastitis	6[b]	1	2	0	3	1	7	6-13	8.8
Fibrocystic mastitis	3[c]	0	0	1	2	1	4	6-12	9.3
Intraductal epithelial papilloma (hyperplasia)	1	1	0	0	0	0	1		6
Fibro-adenoma	4[d]	0	1	2	4	3	10	1-13	8.2
Epithelial canalicular adenocarcinoma	36[e]	0	6	11	30	26	73	5-14	9.8
Mixed tissue malignant tumors	15[f]	2	1	4	12	7	26	5-14	9.2
Adenocarcinoma	1	0	0	0	0	1	1		?
Skin tumors of the breast	1[g]	0	0	0	1	0	1		9
Total	67	4	10	18	52	39	123	1-14	8.54

*Breasts are numbered from anterior to posterior. In bitches of small breeds in which breasts may be absent, the inguinal breast is always number 5, and number 1 may be missing. [a]Also had mixed malignant tumor. [b]Three of these cases had carcinomas in other breasts. [c]One case 6 years old was spayed; 1 case 10 years old also had an adenocarcinoma. [d]One specimen contained cartilage. [e]Four cases had recurrences and 13 cases had metastasis at time of operation. One spayed female had a grade 4 in number 3 breast with death from metastasis eighteen months later. Two tumors had undergone squamous cell metaplasia and recurred in eight months in two breasts. [f]Three cases had recurrences and 2 had metastases at time of operation. [g]Hemangioma; this case was not tabulated with the breast tumors.

merous in Boston Terriers and Fox Terriers. Probably this is not significant because in this practice these breeds were seen most frequently.

In this series, almost without exception, the tumors occurred in bitches that had not produced young—they rarely occurred during their reproductive life. Frequently, in these cases, pseudo-pregnancy accompanied by lactation and engorgement of the breasts followed heat; tumors appeared later. This observation supports Moore's theory that stagnation of milk is an important causative factor of mammary neoplasms.

It is significant that tumors were found in only 2 spayed bitches. A fibro-adenoma of the cystic pericanalicular type was removed from a 6-year-old Pointer and an adenocarcinoma was removed from an 8-year-old Cocker Spaniel. The latter bitch was spayed at the age of 6-1/2 years, and nineteen months later an adenocarcinoma, grade 4, 4 by 3 by 3 cm., was removed from the third right breast. She came to necropsy in eighteen months with generalized metastasis of the lungs, liver, and associated lymph nodes. It is possible that the tumor was present and unnoticed at the time of spaying.

Malignant changes were present in 90, or 73 per cent, of 123 tumors considered. Single involvement of the breast occurred in 41 cases and multiple in 26 cases.

The pathology and the case histories show that the adenocarcinoma developed most rapidly and was the most malignant. At the time of the first examination, metastasis was present in 13 out of 36 adenocarcinomas, compared with two instances in 15 tumors of the mixed group.

In several of the cases having multiple breast involvement, an adenocarcinoma was found in one and a mixed tumor in another gland. Mastitis was found in the breast of 1 bitch accompanied by adenocarcinoma in one of the other glands. Ewing[3] says that, in the human subject, mastitis is predisposing to carcinoma. Perhaps mastitis was present early in the carcinomatous glands.

Necropsies on a limited number of dogs with mixed tumors showed that only the carcinomatous or epithelial structures metastasize. Huggins[4] found in his cases that only the epithelial structures metastasized.

The abdominal glands were involved more frequently than the thoracic glands. For the purpose of identification, the breasts were numbered from anterior to posterior; the breast nearest the axilla was number 1 and the inguinal breast number 5. In small breeds, where the anterior breast may be absent, the inguinal breast was number 5; number 1 is omitted. The tumors were located as follows:

breast 1	4 tumors
breast 2	10 tumors
breast 3	18 tumors
breast 4	52 tumors
breast 5	39 tumors

Schlotthauer[5] and Huggins[4] reported their series to be distributed in about the same proportion.

THE ESTRUS CYCLE

In the dog, ovulation occurs spontaneously at estrus and is followed by corpus luteum formation which is retained by the ovary through metestrus. This prolonged luteal phase is climaxed by pseudo-pregnancy lactation sometime between the seventh and tenth week after estrus. This phenomenon may occur in the absence of pregnancy or even copulation.[6] Huggins[4] reports that oöphorectomy performed during pseudo-pregnancy will prolong spontaneous mammary secretion many months, possibly as long as a year. The normal breast involuted greatly following oöphorectomy, at anestrus, but no noticeable involution occurred in the tumorous breast. DeVita[7] found that the breast of the bitch atrophied following oöphorectomy during anestrus but continued to secrete if the operation was performed during metestrus.

The normal female dog has a regular rhythm of estrus, the cycle of which is completed each six months.[8] Proestrus, which starts with a slight hemorrhagic discharge from the vulva, lasts four to nine days. Estrus, the stage when the female will accept the male, lasts from seven to fourteen days. Then metestrus develops in two weeks and may last up to three months. Anestrus is that remaining two or two and one half-month resting period between metestrus and proestrus.

LYMPHATIC MAMMARY DRAINAGE

Malignant mammary tumors metastasize by two routes, directly by the blood stream or by the lymphatic system. The lymphatic is the most likely route and must be considered in breast amputation.

Schlotthauer and Stalker,[9] in their studies of the mammary lymphatic drainage, found that this was accomplished through both the axillary and the inguinal nodes. Mammary glands 1, 2, and 3 drain anteriorly by way of the axillary nodes, and mammary glands 4 and 5 drain posteriorly through the inguinal nodes. Usually, there is a complete separation of lymph and blood between the anterior breasts (1, 2, and 3) and the posterior breasts (4 and 5). Schlotthauer and Stalker found that, in rare instances, there were a few interlockings between 3 and 4.

Anteriorly, there were interlocking branches between breasts 2 and 3, but 1 was independent. Posteriorly, breasts 4 and 5 had communicating vessels. If a malignancy were to occur in breast 4, breast 5 with the inguinal lymph node must be removed. If such a lesion were to occur in breast 3, breast 2 should also be removed and, to guard against the possibility of abnormal communication between breasts 3 and 4, all the breasts on the affected side together with the inguinal and axillary nodes and superficial fascia of the underlying muscles must be removed.

When the radical operation is done, there should be a thoroughness of the surgical treatment. The overlying skin should be incised widely on each side of the gland. The breast and all others in the line of drainage, together with the underlying subcutaneous tissue, should be taken as well as the superficial fascia of the exposed muscle. Occasionally, lymph vessels extend into this fascia.

The inguinal nodes are easily removed for they lie at the posterior border of the fifth breast adjacent to the inguinal ring. The removal of the axillary node presents a more difficult problem in that the node lies in the axilla. It is situated superficially, and posteriorly to the brachial vessels. To remove the node and the vessels, the pectoral muscles must be resected. Only occasionally is this anterior radical dissection warranted because resection of the pectoral muscle impairs action of the foreleg.

Treatment—General Consideration.—It has been shown that breast tumors of the nonspayed bitch are common and that 73 per cent of these growths are malignant in nature. Surgical interference is the only treatment to be recommended. Therefore, this condition should be given serious consideration. The presence of a growth in a breast is an indication for immediate removal, granted, of course, that the neoplasm is still operable and the age and physical condition warrants.

An accurate diagnosis of the lesion will determine the type of operation indicated. When the tumor is benign, a simple mammectomy is adequate; when malignant, the operation must be radical with removal of the anastomosing breast and lymph node. When in doubt, a biopsy should be made. This can be done easily by removing aseptically a small section for microscopic diagnosis. The biopsy can be done under local anesthesia. Novocain is infiltrated in the skin well outside the limits of the breast. This precaution is taken to avoid tissue transplant by the needle and fragmentation of cells, which would enter the blood stream. The incision is closed with a mattress suture if there is no hemorrhage and an added small gauze pack when bleeding occurs. The nature of the tumor can be determined in less than twenty-four hours. If a biopsy is not made, every tumor should be regarded as malignant and treated as such. If malignant, and a radical operation is done, an oöphorectomy further retards metastasis and recurrence. This may be done at the same time as the breast surgery. Oöphorectomy causes involution of the mammary tissue. Tumors seldom occur in the spayed bitch. This must be done during anestrus or hypertrophy of the breast glands may occur instead of involution. If the breast operation is done during estrus or metestrus, the oöphorectomy should be delayed until anestrus.

THE OPERATION

Operations on the mammary gland, whether a simple mammotomy, radical mammectomy, or a combined radical mammectomy and panhisterectomy, are major procedures. The patient must be prepared with the utmost care. As most of the patients are over middle age, they have passed the peak of metabolic activity. This impaired function affects the water balance and also the functions of the kidney, liver, and bone-marrow. In themselves, these effects add to the hazard by lowering the threshold of reserve. It is not uncommon to have such sequels as postoperative shock, hepatic failure, uremic poisoning, and hypoproteinemia complicating the recovery. Preoperative whole blood transfusions, plasma (normal serum) infusions, and the intravenous and subcutaneous administration of saline and glucose solutions lower the mortality markedly.

Anesthesia.—Because of the age, this is an important matter. Obesity complicates the problem. Named in order of their safety, the anesthetics recommended for this operation are: (1) novocain by local infiltration; (2) ether by inhalation; and (3) pentobarbital sodium intravenously. Patients should receive a preoperative sedative of morphine and atropine one hour before. This will add greatly to the ease and success of administration.

Local infiltration of novocain (2%) is a satisfactory anesthesia for removing breast tumors, provided the injections are made well outside the limits of the involved tissue. Were the hypodermic needle used for making the infiltration to pass through the tumor mass, it is possible to transplant neoplastic cells into healthy tissue. In rough handling of the tumor mass, it is possible to detach cells which the blood stream will pick up and transplant elsewhere in the body.

The infiltration should be made well outside the zone of the involved tissue but completely surrounding it and over a great enough area to include the adjacent lymph node. Novocain anesthesia may likewise be used if the operation is to include panhisterectomy. In that event, the peritoneum and the ovarian ligaments are the only sensitive structures involved. The balance of the tissue to be handled or removed, being relatively free from sensory nerves, needs no anesthetic. Novocain is the anesthetic of choice for either simple or radical mammectomy.

Ether is the choice for combined mammectomy and panhisterectomy. Pentobarbital sodium is relatively safe but has a tendency to prolong hypnosis in old animals owing to the low oxidizing powers of senility. It is a good precaution to follow the use of pentobarbital sodium with some analeptic immediately after the operation. Light doses of pentobarbital sodium are recommended. If the

depth of narcosis is not sufficient, a slight amount of ether will suffice.

Operative Technique.—The procedure involved in mammectomy is extensive, time consuming, and exposes a vast region. An operation of this proportion is major surgery. It can best be executed by two operators.

Suppuration, inflammation, and rupture of the sutures are the most common postoperative complications. The most common causes are: (1) The area prepared for the operative field is too small. (2) The operator contaminates the wound by not wearing sterile gloves, sterile gown, mask for mouth and nose, and a cap. (3) A break in sterile technique either before or during the operation. (4) The wound is not properly sutured to eliminate pockets or prevent necrosis.

Radical mammectomy usually necessitates the removal of more than one gland along with the excision of the subcutaneous tissue, superficial fascia, and adjoining lymph node. The approximation of the wound margins must be accomplished without leaving pockets where blood and serum will collect. A few large blood vessels and many small ones are always encountered and, if these are not ligated, hemorrhage into the wound will result. Blood shed in this manner collects in tissue spaces and being relatively nonabsorbable, it must be drained before repair is complete. The joining of the underlying fat and connective tissue must be done in such a way as to prevent necrosis from suture pressure.

An elliptical incision on both sides of the breast, well away from the tumors and down through the underlying tissue, removes the subcutaneous tissue completely and far enough away from the breast to prevent recurrence. Most operators prefer to start with the breast farthest away from the involved lymph node and dissect toward it. When the primary incision is made with the knife through the skin and subcutaneous tissue, the rest of the exploration can be made by blunt dissection. This can be accomplished with scissors or the gloved finger, or both.

The many blood vessels in the skin should be clamped with hemostats and ligated as they are severed. There are a few deep vessels to handle. If the anterior breasts are removed, mammary branches of the external thoracic artery must be ligated. In the case of the posterior breasts, the anterior branch of the external pudic artery must be ligated adjacent to the inguinal ring, and so must a small branch of the internal pudic artery near the vulva.

When the removal of the neoplasm, subcutaneous fat, and connective tissue, together with superficial fascia and lymph node, is completed and all the vessels are ligated, the wound margins may be approximated. Catgut, medium chromic, serves this purpose well. The smallest that will hold is preferable because it minimizes irritation. Usually, two or three rows of continuous sutures will pull the underlying tissues together nicely. It is well to tie the catgut at about 2-inch intervals as a precaution to prevent gaping in case a stitch should tear away. The skin margins are then secured with interrupted mattress sutures.

If the four posterior breasts are involved, it is possible to remove them with one incision, provided there is sufficient skin to permit repair. Occasionally, when such an extensive repair is made, 2 or 3 inches of the posterior suture line next to the vulva will rupture because of pressure necrosis. Even if this does occur, it is better technique to have this slight complication than to submit the patient to a second operation.

When the gland is removed, a section of it and the involved node should immediately be placed in a 10 per cent formalin solution preparatory to the pathologic examination. The node should always be examined for metastasis. Even if a biopsy of the breast had been made, it is good practice to have additional sections made for study. An enlarged node may result from inflammation as well as from the presence of tumor tissue.

No dressing is needed over the wound. Healing is more rapid and satisfactory if the patient is left hospitalized for ten days to two weeks. The stitches may be removed in about a week as indicated by the progress of healing.

X-ray therapy has not been a satisfactory method of treating breast tumors in the hands of most clinicians.

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[4]Huggins, C., and Moulder, P. V.: Studies on the Mammary Tumors of Dogs. J. Exptl. Med., 80, (1944): 441-454.
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Reports to the effect that applications of powder composed of dried blood cells give important results in the treatment of ulcers of varicose veins (human) and other chronic sores (*La Presse Medicale, 35,* (1945): 474) may have a certain significance in veterinary surgery.

The dynamics of the alkaloid colchicine on the mitotic rhythm is bringing it into use in the treatment of new growths, along with x-ray therapy. An ointment of 0.05 Gm. of colchicine to 100 Gm. of lanolin, when applied to papillomas, is reported to give an interesting response.

Regular reproduction is a family characteristic in dairy cattle.

Muscle Denervation

The structural changes in muscle tissue deprived of its motor-nerve supply were studied critically for the first time in man (to our knowledge) in casualties of the war. In veterinary surgery, the denerving operations (neurotomies) concern sensitive nerves only. The division is made below the branchings of the motor fibers and the trophic changes ensuing in the denerved zone have been found to be imperceptible after a century or more of study. The débacles of neurotomy are due not to trophic changes but to physical injury of lesioned structures.

Wartime biopsies by capable pathologists[1] have shown that accidental motor-nerve cleavage results in atrophy, degeneration, and interstitial fibrosis, the latter being the gravest because incurable despite surgical restoration of the nerve supply. Fibrosis, occurring as early as three months after the peripheral nerve supply was interrupted by injury, explains the permanence of well-known neuropathic paralyses in animals, namely:

1) *crural paralysis* following the acute stage of azoturia which remains permanent (at least partly) if not cured within four or five months;

2) *scapular paralysis* (sweeny) from injury of the suprascapular nerve—a collar contusion or a nerve-stretching injury in draft horses, chiefly farm horses;

3) *brachial paralysis* of horses and dogs due to serious injury to the radical of the brachial plexus; in horses, generally sustained by stumbling and commonly associated with fracture of the first rib; in field dogs by collision with fences or brush[2];

4) *facial paralysis*, generally unilateral, due to injury to the trunk of the facial—7th cranial—nerve at the level of the mandibular border below the maxillo-temporal joint; and

5) *left recurrent laryngeal nerve paralysis*, due to toxi-infectious injury of the trunk in its thoracic relations and the cause of "roaring" in horses, which was critically studied as to muscular changes by the Department of Pathology, College of Veterinary Medicine, Ohio State University[3].

Accidental cleavage of motor nerves is rare in animals because of the sheltered location of mixed nerves.

[1]Aird, R. B., University of California: Changes in Human Muscle after Denervation. Excerpt from Report of the Committee on Medical Research, O.S.R.D. Bull. U. S. Army Med. Dept., *5*, (June 1946): 619.

[2]The nature of the nervous injury has not been described by small animal pathologists.

[3]Cole, Clarence R., Ohio State University: Changes in the Equine Larynx Associated with Laryngeal Hemiplegia. Am. J. Vet. Res., 7, (July 1946): 69-77.

The Pippin Comb

When a scalpel, scissors, forceps, comb, or any gadget in every day use becomes one of those precious units of the doctor's outfit, it will be found to score high in elegance, "feel," maneuverability, excellence of material, and suitability for the purpose. That's why a circular illustrating a comb that meets these specifications caught the editorial eye, and consent to reproduce a picture of it was obtained from the Goshen Laboratories, Inc. Users of the prosaic combs generally employed to straighten out the gnarls of the canine toupee need not be told of the advantages of the Pippin.

—Goshen Laboratories, Inc.
The Pippin Comb

Lymphoblastoma, the most common malignant tumor of farm animals, occurs in the heart, spinal cord, spleen, kidney, liver, and lymph glands.

Trichomonad-infected bulls have been successfully treated with potassium iodide *per os* and sodium iodide per vein.—*Dr. David E. Bartlett, Beltsville, Md.*

The most common deficiency in dairy herds is lack of water.

CLINICAL DATA

Limitations in the Use of Penicillin in the Treatment and Eradication of Bovine Mastitis

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PENICILLIN will, in all probability, repeat the career of many other agents which, from time to time, have been discovered and found to be of great value in the treatment of disease in man and animals. The wonder drug, whether penicillin or sulfanilamide, enjoys a brief period of unstinted praise; miraculous results accompany its use and 99 per cent of the cases treated recover, so that at last the longed-for panacea seems to have been discovered. As time passes and more comprehensive and exacting tests of the agent are made, limitations are discovered which had not been anticipated, so the final judgment is often far removed from the unstinted praise which accompanied the dèbut in the pharmaceutical world. Barring the unfortunate appearance of penicillin-resistant strains of *Streptococcus agalactiae*, this drug bids well to hold a place of honor in the treatment of mastitis not yet accorded any other therapeutic agent. In this paper, the authors deal with some of the limitations of penicillin in the treatment of mastitis which, we believe, have already been detected.

In most of the reports which have appeared up to the present time, inadequate information has been presented as to the type of mastitis which has been the subject of penicillin treatment. We are not thinking primarily of etiologic differences in the invading organisms or whether the cases are acute or chronic, but rather whether the infection is actively spreading in the herd or whether the infection is comparatively dormant.

In the previous article[1], we suggested that failure to obtain the high percentage of cures reported by other workers was most likely due to the fact that the agent under test—penicillin—was not being used in comparable circumstances. This we believe to have been the case for reasons which will appear in this paper. It should be noted that this report deals with infected herds rather than infected individuals. In some outbreaks of mastitis, penicillin, while of great therapeutic value, was ineffective in removing infection from the diseased udder. In common with many other investigators, we have frequently experienced satisfactory results in the eradication of *Str. agalactiae* infection from herds where infection was present but not particularly active.

PENICILLIN IN THE TREATMENT OF OUTBREAKS OF ACUTE MASTITIS DUE TO STREPTOCOCCUS AGALACTIAE

In both instances here reported, the histories of the outbreaks were remarkably similar: sudden onset; rapid spread; constitutional symptoms in most cases not marked; a number of infections terminating in atrophy or fibrosis of the quarter; and milk flow greatly reduced. Rapidity of spread, rather than severity of infection, was the characteristic feature.

Herd T.G.—History.—The herd contained 27 high-producing Holstein-Friesians. The management and milking technique was good, but sanitation was neglected due to a belief that bacterial infection played only a negligible rôle in the causation of mastitis. The grain fed had recently been changed from oat chop to wheat. No additions had been made to the herd. A few mild cases of mastitis occurred every year but caused no concern to the owner. The first case was acute but responded well to sulfanilamide. No further cases occurred for seven days, after which time new cases were reported almost daily for a period of about six weeks. Milk production fell heavily and, before the storm was over, many quarters had

been permanently damaged and most of the diseased quarters remained infected in spite of thorough treatment. At the present time, nearly one year after the outbreak, occasional new cases are reported among the heifers, and a few of the old infections flare up. Three badly infected animals were removed from the herd. As soon as the outbreak was recognized, thorough sanitation was introduced. The seriousness of the outbreak is revealed by the following facts:

Total no. of milking cows..... 27
Total no. of milking cows infected..... 25
Total no. of quarters infected..... 50
No. of quarters treated with penicillin. 46
No. of quarters freed from infection (36.1%) 17

The infection was due to *Streptococcus agalactiae*. Slight alpha hemolysis could be detected in cultures, and the colonies forming on the blood agar plates were smaller and more compact that usual.

Penicillin Treatment

No. of quarters treated	Dosage and administration (given in 200 cc. of sterile water)	Freed from infection %
5	10,000 u.—4 infusions 24 hr. apart	40*
2	25,000 u.—6 infusions 12 hr. apart	50*
8	25,000 u.—4 infusions 24 hr. apart	50*
12	50,000 u.—2 infusions 24 hr. apart	33
9	50,000 u.—3 infusions 24 hr. apart	12.5
4	50,000 u.—4 infusions 24 hr. apart	25
3	75,000 u.—4 infusions 24 hr. apart	33.3
3	100,000 u. in oil	66

*Quarters given immediate treatment by owner.

Comment.—From the standpoint of removing infection from the udder, the treatment was most disappointing. Clinically, the results were good as one or two infusions usually resulted in marked physical improvement. The treatments recorded in the table are, in almost all cases, the first treatments given. In many of these cases, two or three courses of treatments were given. The unitage of penicillin seemed to make little difference. The favorable result from low unitage is, we believe, due to immediate treatment by the owner. Owing to the cost of treatment—daily trips being necessary—the owner purchased an infusion outfit and penicillin and treated cases himself as soon as the slightest evidence of mastitis appeared.

The limitation of penicillin as demonstrated here is essentially therapeutic. It would suggest a rapid penetration of the parenchyma of the gland by the *Str. agalactiae* and inability of the penicillin to effectively contact the organism. A more rational treatment would be the immediate use of penicillin for clinical purposes only, until the outbreak subsides, followed by tyrothricin or penicillin in the "dry" quarter to eradicate.

Herd McK.—History.—This valuable Holstein-Friesian herd of 25 milking cows had been comparatively free from mastitis for many years. No recent additions had been made to the herd and no change in milking practice or management. The feed had been changed about six weeks prior to the outbreak by the addition of "copra meal." Sanitation was not thorough. The outbreak appeared suddenly and, within two months, almost every cow was infected. The disease was characterized by sudden swelling of the quarter, slight or no constitutional symptoms, marked diminution in the milk flow, with change in the physical appearance. Distinct atrophy of the gland occurred in approximately 20 per cent of the cases. The infection was due to *Str. agalactiae*.

Total no. of milking cows..... 25
Total no. of cows infected..... 21
Total no. of quarters infected..... 45

Treatment with Penicillin.—The treatment was administered first by the attending veterinarian, later by the owner and, finally, a few quarters were treated by the authors. Satisfactory records of the treatments had not been kept. The majority of the infected quarters had been infused twice and a few three times with 50,000 units in 200 cc. of boiled water. The cases below were checked bacteriologically to determine the effect of the treatment.

Result of Treatment (Incomplete)

No. of quarters	Dosage and administration	Result
10	50,000 u.—1 treatment only	Infection present
12	50,000 u.—2 infusions at 24 hr.	Infection present
4	50,000 u.—2 infusions at 12 hr.	Infection present

Comment.—With due regard to the fact that the record of the herd is incomplete, yet the failure of penicillin to eradicate the infection in the quarters examined is quite striking. The possibility of rapid reinfection after treatment can not be excluded. In spite of this, the owner was enthusiastic in his praise of penicillin due to the excellent clinical results in the majority of cases. In his hand, the disease had been combated by the immediate infusion of infected quarters. The limitation of penicillin here is both specific and economic. The economic limitation was largely removed when penicillin was used by the owner. Twenty years ago, he had experienced a serious outbreak which ruined the herd.

PENICILLIN IN CHRONIC MASTITIS

Hand Herd.—History.—A valuable herd of 40 purebred Jerseys (milking cows) under ex-

cellent management, with good sanitation and housed in a modern dairy barn,—mastitis had never been prevalent in it.

Mastitis Survey.—A physical examination of every udder was made and a bacteriologic examination of the milk. Ten infected quarters in 5 cows were discovered. One cow was a carrier with no history of clinical mastitis. The remaining 4 cows all showed clinical evidence of mastitis. In two quarters, the milk was curdled and slight diffuse fibrosis was present. *Str. agalactiae* was isolated from every case.

Treatment.—All animals received the same treatment, *i.e.*, six infusions of 50,000 units in 200 cc. distilled water at twelve-hour intervals.

Results.—All quarters were freed from infection and have remained free for five months. In 2 cows, there was a total increase in milk production following treatment amounting to 7 lb. per day. Treatment was 100 per cent effective.

Comment.—In our experience, penicillin is most effective in the eradication of infection in this type of herd when sanitation is good and the infection is dormant. This is the ideal time to attack mastitis and not when a mastitis storm is present. This herd is included to show the excellent results which may follow penicillin treatment in selected cases.

PENICILLIN IN THE TREATMENT OF ACUTE MASTITIS DUE TO STAPHYLOCOCCUS AUREUS

Kingsdale Herd.—History.—A herd of purebred Jerseys which were kept under ideal conditions of sanitation and management. Several animals had been added to the herd recently. Prior to our visit, 3 cases of acute mastitis had occurred in quick succession. Two cases had terminated fatally with gangrene of the udder. Infusions of penicillin, 50,000 units every twenty-four hours with sulfanilimide, had been used but with negligible results. This was probably due to a delay of from twelve to eighteen hours in instituting treatment. The third case showed the same rapid course of infection but was treated within twelve hours with penicillin locally and sulfathiazole by mouth. Recovery was delayed but complete. *Sta. aureus* in pure culture was isolated from the quarter. The history of the fourth case is given below in detail:

Tuesday p. m.—Temperature, milk flow, and appetite all normal.

Wednesday 6 a. m.—Appeared normal; no change in the milk flow.

8 a. m.—Appeared a little uneasy; temperature 103 F, and the left front quarter was slightly swollen and tender.

10 a. m.—Not eating, temperature 106 F.; penicillin 100,000 units infused and sulfathiazole given orally.

Thursday, 10 a. m.—Appeared brighter; temperature 104 F. and eating a little hay; penicillin 100,000 units infused.

6 p. m.—Marked improvement; temperature 103 F. and swelling in the quarter reduced. The case terminated in complete recovery. *Sta. aureus* in pure culture was isolated from the udder.

A bacteriologic examination of the herd showed 5 cows to be harboring hemolytic *Sta. aureus*. The herd was inoculated with a mixture of *Sta. aureus* bacterin and toxoid. No further cases have occurred.

Comment.—The remarkable recovery was, no doubt, due to the immediate and vigorous treatment. Delay in commencing treatment in *Sta. aureus* infection is always serious. This confronts us with another variety of limitations due to the necessity for immediate treatment in cases of *Sta. aureus* infection. This can not always be remedied.

PENICILLIN IN THE TREATMENT OF CHRONIC MASTITIS DUE TO STAPHYLOCOCCUS AUREUS

Herd McA.—History.—In a small herd of Shorthorns, 4 of 7 cows became infected with *Sta. aureus*, the infection being spread by the hands of the milkers. The constitutional symptoms were mild, but the milk flow decreased rapidly and the physical quality of the milk was greatly altered. Six quarters were infected.

Treatment.—Penicillin 20,000 units, repeated at 24-hour intervals for three infusions had been administered without results. Consulted about the case, we made a bacteriologic examination and found *Sta. aureus* to be the invading organism. Guided by previous experience of the unsatisfactory results obtained from the use of penicillin in *Sta. aureus* infection, we prepared an autogenous bacterin. Two inoculations were made ten days apart, with highly satisfactory results in improvement in both quality and quantity of the milk. This was evident five days after the first inoculation. No attempt was made to eradicate the infection.

Comment.—Although the units of penicillin which had been used were far too low, it is very doubtful whether higher concentrations would have been any more effective. The economical, as well as the effective, treatment in such cases is the use of autogenous bacterin. This indicates another limitation in the use of penicillin, *i.e.*, the necessity of a bacteriologic check on the nature of the infection. The efficacy of penicillin in the treatment of mastitis is dependent upon the kind of bacterium responsible for the infection.

CORYNEBACTERIUM PYOGENES INFECTION

In our experience, very few cases of *Corynebacterium pyogenes* infection have

responded to penicillin treatment. This is apparently due to the rapid penetration of the parenchyma following infection. The majority of the cases treated have followed injury to the teat or quarter. In addition to topical treatment, penicillin should be infused as a prophylactic for several days following the injury. This, in most cases, necessitates penicillin being used by the farmer. For most practitioners, this would constitute another limitation in the use of penicillin.

CONCLUSIONS

1) In current veterinary practice, it is evident that penicillin has limitations which at first were not recognized.

2) In acute outbreaks of mastitis with rapid spread, penicillin is of limited value in the eradication of the infection, but has marked clinical value and should be used for this purpose only in such outbreaks.

3) The intelligent use of penicillin necessitates a bacteriologic diagnosis of the infection present in the udder. Its indiscriminate use will bring a most valuable agent into disrepute. In certain infections, other methods of treatment should be combined with penicillin infusions.

4) The value of penicillin as a therapeutic agent in mastitis due to *Corynebacterium pyogenes* and *Staphylococcus aureus* is dependent upon its immediate or early use. Delay in administration may have serious, or even fatal, consequences.

5) To obtain the maximum benefit from penicillin will, in some instances, necessitate the administration of the drug by the trained stockman under the supervision of the veterinary surgeon.

Reference

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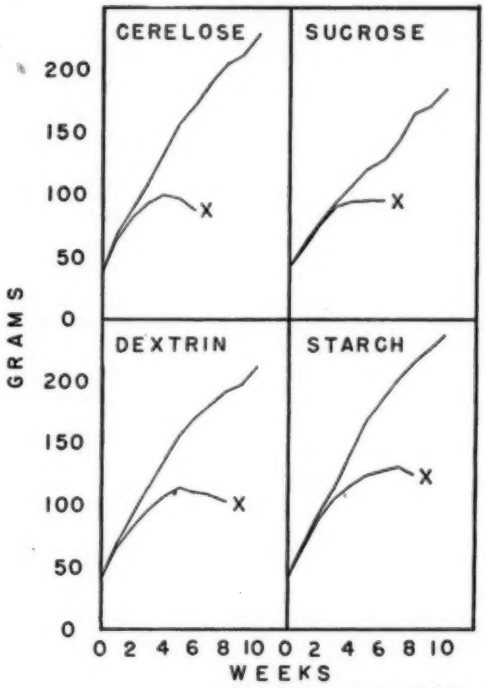
Intestinal Vitamin Synthesis and Sulfonamides

Utilizing its microbial flora, the normal mammalian digestive tract can fabricate its own B vitamins from the carbohydrate and other components contained in normal feedstuffs. Since both the somatic needs of B fractions and the kind of carbohydrate consumed have been found to alter the synthesis, their production imposes itself as a part of the digestive process to be definitely clarified in regard to inhibiting factors, such as the oral administration of certain sulfonamides. The inhibition has been reported to be greatest from the slow-absorbing types—those which sojourn longest among the "digestive bacteria", of which succinylsulfathiazole (SST) is an example. In respect to this drug, Skeggs and Wright (*J. Nutr.*, *82*, Oct., 1946: 375-388) have shown by critical experiments



—*From Journal of Nutrition.*

Growth curves of the rats receiving the various carbohydrate diets. In each instance, the upper and lower curves represent, respectively, the results obtained with the basal diet and the corresponding diet containing SST.

that folic acid and biotin (and sometimes pantothenic acid) deficiency can be produced in definitely determined degrees in rats fed purified diets which, without that drug, synthesized at least suboptimal amounts of these B fractions. The depressive syndrome occurred regardless of particular carbohydrate components: glucose, dextrin, lactose, sucrose, corn starch.

Though the study of this phase of mammalian physiology is new and incomplete, the mechanism of vitamin synthesis and inhibition in the digestive tract can be rated as one of incalculable importance in animal feeding and therapeutics. In so far as specific function is concerned, little was known of digestive microbiology before the war.

Advantages of
Vaccination Against Bovine Brucellosis

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FOR MANY YEARS brucellosis control has been discussed, because of the confusion surrounding the subject, at veterinary medical meetings; the confusion arose because we have not all had our eyes on the same goal.

Many practitioners are so vaccination-minded that all they want in a brucellosis-control program is an all-out vaccination campaign for every bovine animal in the country. Although I earnestly disagree with this type of thinking, it is highly appealing to the laity, gives the owner a feeling of security, and offers the veterinarian a source of credit. At the other extreme, we have so-called animal sanitarians who can tolerate no justification for vaccination against brucellosis because it complicates the immediate slaughter of all animals that are not negative to the agglutination test at all times. Another reason for the confusion and lack of understanding among those interested in this problem has been a reluctance to admit frankly that brucellosis control is a responsibility of the practitioner, and that his advice and participation is an absolute necessity to success. Certain general regulations, reports, and records are necessary for the sake of consistent progress, but set rules cannot be followed in the control of this disease without injustice to the cattle owner. His welfare is of paramount importance, and the abstract aspects of the cattle industry are secondary—at least so far as vaccination is concerned.

The practitioner is the only logical individual to make the decision of how Brucella vaccine should be used. His goal in each case should be the establishment of a herd negative to the agglutination test, with as much resistance to infection as possible. The manner in which this can best be done and the rapidity with which it can be accomplished is something only he and the owner can decide. Where infection exists one question must always be answered. "By what line of action will this herd of cattle yield the owner the most profit over a period of the next few years?" The owner of infected cattle must not be permitted to profit at the expense of others; hence reactor animals must be properly identified and restricted by state and federal authorities as the local conditions suggest. Cattle are kept for various purposes; in some instances, a calf crop is most important, sometimes milk production is the source of revenue, and where breeding stock is sold bloodlines must be maintained.

How, then, shall the practitioner discharge his responsibility in the use of Brucella vaccine? The following procedure seems to be reasonable and effective.

1) *In Infected Herds* (where the owner cannot afford to eliminate reactors immediately).

a) Calfhood vaccination provides protection for heifer replacements, so that they will not develop brucellosis when they reach maturity. Under severe exposure, such animals may not always be able to maintain a negative agglutination titer.

b) Adult vaccination has been the means of salvaging many herds where the owner could not bear the economic burden of a test and slaughter program. Within the last year, I have tested several herds where severe outbreaks of brucellosis had occurred approximately five to six years ago. Many animals are now completely negative.

c) In herds where the disease is actively spreading, the vaccination of negative, open, or recently bred (3 mo.) females seems to reduce the severity of the disease. Adult animals respond to Brucella vaccine just as satisfactorily as do calves, and with no ill effects other than the prolonged positive agglutination titer.

This titer does not continue for an extremely long time in all instances. In February, 1945, I had occasion to vaccinate 20 negative cows that were added to a positive herd. Approximately seven months later, when the entire herd was tested, 11 of these 20 cows had already returned to a negative status, even though they were under heavy exposure.

d) The vaccination of positive adults is difficult to evaluate. Strain 19 is an organism of high antigenicity and low pathogenicity, while the strains of Brucella involved in field out-

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breaks may be of high pathogenicity and low antigenicity. Therefore, the vaccination of reactors might be of value in the prevention of repeated abortions in some herds. Animals that have aborted should remain open four or five months to reduce the chances of a second abortion. There is little lost in vaccinating adult reactors that are to be kept in the herd, and it does satisfy the owner.

The vaccination of either positive or negative adults pregnant beyond the fourth month has little to recommend it. If the animal is exposed or infected, it is doubtful whether Brucella vaccine will prevent abortion. The owner expects immediate results, and an abortion following vaccination may be attributed to the vaccine; and correctly so in some instances, because evidence indicates that strain 19 is capable of producing placentitis and abortion when injected into cows in advanced pregnancy.

Certainly all vaccinated adult animals must be regarded as reactors, since no differentiation between the causes of reaction can be depended upon. All reactor adults should be restricted to their premises by state regulation until they (1) return to a negative status; (2) are sent for slaughter; or until they (3) are transferred under permit to another herd of similar brucellosis status, where they should again be restricted.

Dosage in the vaccination of adults is open to question. Some veterinarians use a regular 6-cc. dose, others a 12-cc. dose, and still others 2, 6-cc. doses at fourteen-day intervals. No one seems to be sure of what is the correct procedure.

Intradermic vaccination of small doses of Brucella vaccine has been used experimentally in calves, and reports appear suggestive that this method may replace the subcutaneous method, but more information regarding the duration of protection is necessary before it should be routinely employed. Brucella vaccine has not been an easy product to use because of its instability and short dating. Strain 19 has been desiccated by lyophilization; it is available commercially and has the definite advantages of greater stability and of longer dating, which simplify the supply problem. The principle of desiccation is sound, because it insures maximum viability at the time of use.

2) *In Clean Herds.*

a) Calfhood vaccination provides the best known means of establishing a relative immunity against possible subsequent exposure from outside sources. Investigations and clinical experiences show that unvaccinated cattle are more susceptible to brucellosis than are heifers and cows that have been vaccinated as calves, at least during the first three pregnancies.

b) Few clean herds are so completely isolated that exposure does not occur at some time. Exceptions may be found in areas where the incidence of the disease is extremely low. North Carolina is an example, where less than 1 per cent of nearly a half million cattle reacted over a period of three and one-half years. Calfhood vaccination with strain 19 is of little risk to the adult animals in a clean herd, and the value of protection of the heifers is greater than the risks involved. One state makes calfhood vaccination a prerequisite to the collection of indemnity for brucellosis reactors.

The post-vaccination bleeding of calves is unnecessary. In large herds where the problem of controlling brucellosis is more complicated than in small herds, I am routinely bleeding the vaccinated calves two to three weeks after vaccination. The majority react strongly, but not infrequently, 1 of a group of calves does not react. When such calves are revaccinated, I have never found one that did not react in another two to three weeks. Agglutination reaction is not a measure of immunity, but it would seem that the first dose of vaccine did not stimulate the calf in a desirable manner. Perhaps, the opsonocytophagic test would be a better measure of response to the antigen.

Vaccinated heifers are routinely bled before breeding, and only negative ones are bred. The owners of large herds are especially appreciative of sincere efforts to avoid difficulties at a later date.

3) *Vaccination on an Area Basis.*—The vaccination of all heifer calves on an area basis should do much to increase the resistance of the cattle population within a few years. Some frown on state vaccination, but all of us recognize that more calves are vaccinated under such a program than under private enterprise. In Illinois, from June, 1945, to June, 1946, there were 55,510 calves vaccinated at state-federal expense and 15,858 at owner's expense, making a total of 71,368.

SUMMARY

The advantages, then, of vaccination against brucellosis are:

1) The most effective method we have of establishing resistance in heifer calves in infected herds against active brucellosis during their first pregnancies.

2) A means of reducing abortions and other symptoms when the disease is actively progressing among adult animals.

3) The only safe and effective method of establishing immunity in replacements for

clean herds — so that in time they will have some degree of resistance against exposure.

4) A means of establishing a relative resistance of the cattle population when used as a calfhood vaccination program on an area basis.

Limitations of Vaccination in Brucellosis

The advantages and limitations of vaccination against brucellosis have been well demonstrated. It is unfortunate that the advantages cannot be claimed without accepting the limitations, and it is equally unfortunate that there is a distinct tendency to publicize the advantages only. We are, therefore, enumerating and discussing briefly some of the limitations of vaccination in the hope of giving balance to the point of view regarding it. Some of the limitations of calf vaccination are:

1) It sometimes produces permanent reactors that cannot be distinguished from natural cases of brucellosis. This is a distinct loss in purebred herds especially.

2) It does not always produce lasting immunity. Animals vaccinated as calves and exposed several years later frequently acquire Brucella infection. Sometimes this occurs in a mild form in which no outward symptoms occur, but elimination of Brucella organisms takes place and sometimes actual abortions occur. In each case, blood reactors are created by the exposure.

3) Calf vaccination in a clean herd may possibly spread Brucella infection to adults in the herd. We know that this does not usually take place, and it is frequently stated, without sufficient evidence, that no cases of spread to the adults due to calf vaccination have occurred. The real fact is that strain 19, used in making the vaccine, is a mild pathogen, and no extensive examinations have ever been made to determine whether outbreaks in adults following vaccination of calves in the same herd are caused by strain 19 or field strains.

4) Calf vaccination, because it tends to submerge the symptoms of brucellosis, frequently is substituted for all other methods of control looking toward the establishment of clean herds. This gives temporary relief in the individual herd but, whenever vaccination causes blood testing to cease, it postpones the day when an advance against the disease on a broad and secure basis can be made.

Some of the limitations of adult vaccination are:

1) It tends strongly to create permanent reactors that cannot be distinguished from natural reactors.

2) It cannot be depended on to check the spread of brucellosis in a herd, though it may do so sometimes.

3) It causes some abortions when administered to cows in advanced pregnancy.

4) It postpones for a long period the time when the herd can be freed from brucellosis through the use of the agglutination test.

5) It creates a serious sanitary problem where milk from the herd is not pasteurized.

6) Used widely, and indiscriminately (as it actually is used), it leads away from the establishment and maintenance of clean herds.—*R. R. Birch, D.V.M., Ithaca, N. Y.*

Presented before the Section on General Practice, Eighty-third Annual Meeting, American Veterinary Medical Association, Boston, Mass., Aug. 18-22, 1946.

Professor of Veterinary Research and superintendent, Veterinary Experiment Station, New York State Veterinary College, Ithaca, N. Y.

Homologous Swine Erysipelas Antiserum

The experimental infection of hogs with the bacillus of swine erysipelas is difficult to accomplish even with large doses of the organism. On the other hand, weak doses of vaccine under certain circumstances are capable of provoking the disease.

Hegyeli (*Tierärztl. Rundschau., 51*, 1943: 55) demonstrated that intranasal inoculation of concentrated emulsions of the bacillus was followed with typical symptoms of the disease and death in all instances. The value of immune serum produced from hogs depends upon the number of bacilli in 24-hour cultures (used as antigen). Moreover, pork bouillon produces cultures with antigenic values far superior to those made from equine muscle tissue. By this technique, it is possible to obtain a serum, 0.05 cc. of which protects pigeons against the same quantity of virulent culture.—*Abstr. Rec. Méd. Vét., 122, (Sept., 1946): 424.*

Dr. F. R. Beaudette says: Elminate the traffic in live birds and you can control poultry diseases.

Summarization of Discussions on

Vaccination Against Bovine Brucellosis

A. B. CRAWFORD, A.B., D.V.M.
Beltsville, Maryland

WE ARE FORTUNATE this morning to have two men, whose contacts with this subject have been from different approaches, to present their opinions on vaccination in the control of brucellosis of cattle. Dr. Dykstra brings with him many years of experience of a practical nature, *i.e.*, the actual administration of vaccine under various farm conditions; Dr. Birch's experience has been not only along the line of controlled research but also studies of the various factors entering into the area control.

I find little to criticize in the statements of these two men with regard to strain 19 vaccine. From their respective points of view, each has logic and experience to substantiate his particular ideas with regard to the use of vaccine in the control of this disease. Herds indiscriminately vaccinated present a problem if and when they come under federal-state supervision. In defense of the practicing veterinarian, we must realize that he was using vaccine years before federal-state control was initiated. Commercial establishments were licensed to produce Brucella vaccine as far back as 1919. The licensed production of vaccine was restricted to strain 19 in 1932, —eight years before it was officially adopted as an adjunct to other methods in the control of bovine brucellosis. Another factor which should be considered is that the federal-state program was not the result of orderly evolution. On the contrary, it was a program which was thrust upon regulatory officials almost overnight to assist in disposing of surplus cattle. This was not a control program but a slaughter program. If sufficient money and personnel had been available to apply test-and-slaughter to every infected herd throughout the country within a reasonable length of time, no method would have been better for the eradication of brucellosis; but the records show that only 25 per cent of our cattle were tested in six years. It was mandatory, therefore, that owners of infected cattle seek aid from the practitioner and that he should resort to vaccination.

Veterinarian Important in Control Program.—If the services of the practicing veterinarian in the control of the disease had not been available, many herd owners would have been forced out of business as the result of abortion storms. Therefore, the practicing veterinarian has a definite place in brucellosis control. Plans remain to be worked out whereby his services may be fully utilized in harmony with the state programs. Until this is accomplished, no official program can be evolved into a nation-wide project on an area basis—our only hope of ultimate eradication.

Strain 19 vaccination has a definite place in any control program. We must, however, have full knowledge of its limitations as well as its fields of usefulness. It has no curative power. It is not, by itself, a means of eradicating the disease in a herd. When used during calfhood, it will protect about 80 per cent of the animals for a period of three to five years. It will prevent abortion in about 95 per cent of vaccinated animals for the same period. It has a definite use in all infected herds, in the protection of young stock during the clean-up period.

Strain 19 Does Not Eradicate.—The chief criticism in the use of strain 19 vaccine by the practitioner is that it is only palliative in action. Continued blood tests are seldom made of the herd as a whole, and usually no efforts are made to remove the adult infected animals at some period in the course of the herd infection. I am in full agreement with Dr. Birch's statements in this connection. I believe the practicing veterinarian should inform his client that he cannot expect to eradicate the disease by vaccination alone, and that blood tests must be made of each adult animal in the herd at intervals of one year or less to determine which animals are carrying infection, with the ultimate view of disposing of these animals and establishing a clean herd. I believe that before whole herd vaccination is practiced the owner

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In charge, Animal Disease Station, Pathological Division, Bureau of Animal Industry, U. S. Department of Agriculture, Beltsville, Md.

should be advised that the course of the disease in reacting animals or in animals already severely exposed will not be favorably affected by vaccination; that there is a lag period of possibly two to three weeks between vaccination and the production of a serviceable immunity; that the blood titers of the older animals may remain positive for indefinite periods (which will interfere with their sale or interstate shipment); that the vaccination of animals in advanced pregnancy may result in abortion; and that the milk supply may be affected for one or two weeks in the case of lactating cows. Unless whole herd vaccination is restricted to cases where the outbreak is recent, a preferable procedure would be to restrict vaccination to calves or to animals up to breeding age, as in the latter groups the blood titer tends to disappear within six to eighteen months.

Strain 19 in Infected and Clean Herds.—Some practitioners believe that the vaccination of infected animals has some curative value, but our experimental evidence does not show this to be true.

The vaccination of calves in clean herds is desirable in areas in which infection is epizootic. In areas that are relatively free from infection, such a practice should be considered merely from the standpoint of ultimate expediency. If there is a market for vaccinated animals, it may be desirable to practice calfhood vaccination in noninfected areas. This will be an additional expense and some of the vaccinated calves may retain a blood titer longer than is desirable. In a clean herd, a positive or suspicious titer in an adult animal is always a source of annoyance.

Area Basis.—The idea of vaccinating heifer calves on an area basis, suggested by Dr. Dykstra, is basically sound. I am also in agreement with Dr. Birch with regard to the limitations of calf vaccination, but I believe that in infected herds such a practice is mandatory for the protection of young stock.

Transmission of Infection Not Proved.—I believe Dr. Birch is over-critical in connection with the possibility that strain 19 may develop new foci of infection. So far as we know, there has been no authentic report of strain 19 causing an infection that can be transmitted from animal to animal. The work of Mingle and Manthei at the Animal Disease Station was very definite in this connection. They attempted to increase the virulence of strain 19 *Brucella abortus* by its rapid serial passage through normal pregnant cows. A total of 6 animals were used as principals in this test in a small enclosure. The first animal received an intravenous injection of approximately 85 billion strain 19 organisms during the fifth month of pregnancy. This resulted in abortion, and strain 19 was recovered in the aborted fetus and the placental material. The organism was recovered in pure culture, and this procedure was continued serially through 5 other animals of the same kind. Following each recovery of strain 19, groups of guinea pigs were injected, respectively, with the recovered organism and a stock culture of strain 19. No difference was noted in the virulence of any of the recovered strains from that shown by the stock culture.

This was only one phase of the experiment. Another phase covered the prospective spread of the disease at the time of abortion. At the time each principal was injected intravenously, 1 and sometimes 2 normal pregnant cows were placed in a small enclosure. To provide severe exposure, the aborted fetuses and placentas were allowed to remain on the ground until they became putrid. A total of 9 control animals were added to this environment during the course of this test. All of the control animals had normal pregnancies and Brucella organisms could not be recovered from the placental material, colostrum, or blood stream at any time during their residence in this environment. Three of the control animals developed a transient agglutinin response, in no case higher than 1 : 25. Each of these 15 animals was continued in the experiment for a second pregnancy and each produced a normal calf. At the conclusion of the second pregnancy, Brucella organisms could not be recovered from any of the experimental animals, neither the principals which had previously aborted nor the controls that had undergone two normal pregnancies during exposure. While the numbers in this case are relatively small, we believe that the severity of exposure to strain 19 was far in excess of what normally would occur in any herd in which strain 19 was used as a vaccine. The most interesting part of the experiment to me was that, in each of the principals, strain 19 was eliminated spontaneously; in other words, none of these principals became carriers of strain 19. We also have the history of numerous noninfected herds that have been vaccinated with strain 19 and hundreds, perhaps thousands, of negative herds in which calf vaccination has been practiced. To our knowledge, there is no evidence of any spread of strain 19 from a vaccinated animal to a negative animal. It would seem that if such spread took place, at least one authentic occurrence would have been reported in the many years that strain 19 has been used as a vaccine.

Sterility.—Another criticism heard is that strain 19 may cause sterility. In the hundreds of animals that have been used experimentally at the Animal Disease Station in calf vaccination and adult vaccination, which in all cases were equalled by a similar number of controls, no difference has been noted in the breeding ability between these respective groups. In field trials with more than 18,000 animals vaccinated as calves, we have no evidence of a tendency toward sterility as the result of vaccination. There are causes of sterility other than brucellosis. It is possible that at some time a herd was vaccinated in which some condition occurred following vaccination that caused sterility in a number of animals, and without proper proof, sterility was blamed on the vaccination. No direct evidence has ever been offered to prove this point, whereas unlimited evidence is available to prove that strain 19 has no tendency to cause sterility.

Proper Age for Vaccination.—When Buck and Cotton were developing the use of strain

19 as a vaccinal agent, they decided upon the age of 4 to 8 months as the preferable time for calf vaccination because of the more rapid recession of the blood titer during this period. It has been shown subsequently that the effectiveness of vaccination with strain 19 tends to increase with the age of the animal up to breeding age. It has also been noted that the degree and persistence of immunity are less in animals vaccinated at 4 months of age than at 8 months. It would appear desirable, therefore, to increase the age limits for vaccination to 6 to 10 months. This step has already been taken in the states of California and New York.

Immunity.—The persistence of immunity following calf vaccination appears to be variable in different herds, but as a rule, calf vaccination should provide protective immunity for approximately four years. Reasons for variation are the condition of the vaccine at the time of injection, residual infection in the herd which causes sufficient exposure to result in increased resistance, and the fact that natural resistance is bound up fairly closely with the genes. Natural resistance is a quality that can be transmitted in certain families as has been shown by the work of Cameron and others. It is quite possible that the various field strains of *Br. abortus* vary in their virulence.

The gradual recession of immunity suggests the desirability of revaccination at some period following calfhood. In a recent letter, Professor Dalling of the British Ministry of Agriculture and Fisheries informed me that some of the British practitioners are revaccinating just prior to breeding or immediately subsequent to the first calving. I was particularly interested in the persistence of the blood titer following the second vaccination. The evidence was not complete on this phase, but the second vaccinal titer tended to recede rather quickly. Work done at the University of Maryland by Dr. Cornelia Cotton seems to bear out Dalling's statements. Much more work must be done along this line, however, before making definite statements on the recession of the blood titer following revaccination and the optimal period at which it should be practiced.

Methods of Vaccination.—In the early experimentation with strain 19, doses of 10 to 20 cc. of vaccine having a turbidity of 10x on the MacFarland scale were used in individual animals. To determine the lowest quantity that would confer an effective immunity, doses as low as 0.25 cc. were tried. A dose of 1 cc. was apparently as efficient as the larger doses. To be on the conservative side, a 5-cc. dose was arbitrarily established as a standard. Some veterinarians prefer a larger dose, especially if the vaccine is nearing the end of its expiration date. Bureau vaccine has never been increased in density but within the past two years almost all commercially prepared vaccine has been markedly increased in this respect, the average now being about 19x. At the present time, therefore, the users of commercial strain 19 vaccine are injecting almost double the number of Brucella cells that they were two years ago. Moreover, they are injecting vaccine that contains greater viability as a result of the decrease of the expiration date to three months. Thus, there should no longer be a reason for the users of commercial vaccine to make larger injections than the contents of a single dose container.

Huddleson has reported on the use of "mucoid" types of Brucella in preventing and curing brucellosis. If his field trials will substantiate his preliminary reports, the whole field of vaccinal therapy and control of brucellosis must be revised.

The intradermic method of injecting strain 19 vaccine in 0.2-cc. doses appears to be as effective, so far as experimentation has gone, as 5 cc. subcutaneously. The agglutinin response and opsonic index are comparable for a period of two years after vaccination. Strain 19 vaccine injected intradermically causes some sloughing. Therefore, it should not be injected in the subcaudal fold, because the resultant induration and scar tissue interfere with tuberculin testing. Campbell and Rodwell, of Australia, have selected the tip of the tail (intracaudal) as a preferred site for injecting intradermically.

Lyophilized strain 19 vaccine should still be considered as in an experimental stage. In the process of lyophilization, there is an initial loss of about 50 per cent in the number of viable cells. No method has as yet been discovered to prevent this loss. The residual viability persists for a much longer period than vaccine in a suspended state and is much less sensitive to temperature changes. No evidence has been produced to indicate that the antigenicity of the viable cells remaining has been affected. The lyophilized product is prepared from liquid vaccine, and its only advantages are that it will stay viable longer than liquid vaccine and is more resistant to temperature changes.

Chemotherapy.—So far as chemotherapy is concerned, there is nothing, with the possible exception of streptomycin, which appears to be effective in the treatment of brucellosis. At the present cost of streptomycin, even though it were found to be effective against Brucella infection in the animal body, it could not be used in large animal practice. There is no evidence that it has curative value in infected cattle.

Brucella in Milk.—Much has appeared in popular magazines on the dire effect on mankind of the Brucella germ in the milk of infected cattle. *Br. abortus* may cause brucellosis in certain individuals who ingest contaminated milk, but the number of persons infected, in comparison with the number who must at some time or another have drunk such contaminated milk, is extremely small. Therefore, milk infected with *Br. abortus* should not be considered as serious a public health factor as has been suggested.

With regard to strain 19 as a public health factor, when used in vaccinating bovine animals, let us consider its possibilities. Strain 19 does not localize, even temporarily, in the udders of vaccinated calves or open heifers or cows, and such animals, therefore, provide no exposure for man. It may be found at times in the udders of adult animals when abortion occurs as a result of vaccination during ad-

vanced pregnancy; actually, however, the number of pregnant animals that abort as a result of vaccination is relatively small. Moreover, adult vaccination is seldom practiced except in infected herds, and in such herds we have animals that are probably shedding virulent *Br. abortus* in their milk. We have no reason to believe that strain 19 is more virulent for man than field strains of Brucella. By analogy, we have more reason to believe that strain 19, owing to its reduced virulence for cattle, should be of correspondingly reduced virulence for man, and if available evidence relative to the very slight susceptibility of man to virulent *Br. abortus* in milk is true, I believe we may dismiss any serious consideration of strain 19 in milk as a public health factor. Moreover, if vaccination were not performed in an infected herd, a number of susceptible animals which would have been protected by vaccination would contract the disease and be possible carriers of virulent Brucella in their udders.

However, milk contaminated with *Brucella suis* is definitely a public health hazard, as has been demonstrated in the Iowa cases where *Br. suis* localized in the udder of several cows in a herd mingling with infected swine. In other words, *Br. suis* is a much more serious public health factor than is *Br. abortus*. *Br. abortus*, however, is a public health hazard for veterinarians and farmers in the removal of retained placentas and, as such, it is one more reason why we should strive toward eradication of this malady.

It should be recognized by users of strain 19 vaccine that the product has some pathogenicity and that care should be taken in its use. Several instances of local and some general infection have resulted when the handler has accidentally pricked himself with the needle while injecting vaccine.

CONCLUSION

The use of vaccine and other methods in the control of bovine brucellosis should be directed toward eradication. Vaccine serves a most useful purpose in increasing resistance and thus increases calf production during its eradication. But in the final analysis, slaughter of infected animals, either immediately or as soon as vaccinated replacements become available, is the only means by which the disease can be eradicated—a fact to be remembered. It is necessary that blood testing be carried on to determine which animals in a herd are infected. If test-and-retention of reactors meets the immediate need of an individual herd, the retention should be no longer than is necessary to develop vaccinated replacements. Under no conditions should infected animals be retained in the herd for more than four or five years. If the owner will follow the proper sanitary procedures during the clean-up period (and in my opinion this is one of the most essential parts of a program), there is no herd in which infection could not be eradicated in that period. We cannot hope to eradicate brucellosis in any herd by vaccination alone. The proper program must consist of a combination of vaccination, sanitary procedures, and immediate or ultimate removal of all animals showing a titer of 1:100 or higher.

Strain 19 vaccine, while it has limitations, is of much practical value and is the best of its kind available at the present time. It is not ideal, for the reasons stated, but it is hoped that a better vaccine may eventually be obtainable.

Renal Lesions of Equine Infectious Anemia

The importance of renal lesions in the postmortem diagnosis of equine infectious anemia (=swamp fever) is pointed out by Dr. A. I. Fedorov (*Plen. vet. Nekt. Akad.* (Moscow), Abstr. *Rev. Méd. Vét., 97,* (Oct., 1946) : 490). In 40 per cent of 150 autopsies (77% acute and 9% chronic cases), macroscopic lesions were enlargement, subcapsular petechiation, fine surface granulations, and gray nodules in the cortical portion.

Histologic examination of 800 cases revealed modifications of the glomeruli (swelling, hyperemia, histocytic proliferation), hemosiderosis of Bowman's capsule, granular and fatty degeneration, necrosis of the tubular epithelium, and perivascular and periglomerular infiltration with lymphoid cells in the interstitial tissue. In the acute cases, the alterations were degenerative and exudative, while in the chronic ones they were proliferative and sclerotic.

Brucellosis was first demonstrated as a factor in fistula of the withers and poll evil in solipeds in the late 1920's, when Ringard and Hilger (*Bull. de l'Acad. Vét.*, July, 1928) isolated *Brucella abortus* in 13 out of 15 cases of these chronic suppurative diseases. The discovery established new ideas on the dissimilar clinical manifestations of brucellosis in the different mammalian species.

New drugs are exciting, but their use is based on proper diagnosis. Don't be swept off your feet by early reports.—*M. E. Boyer, Freeport, Ill.*

Vaccination Against Brucellosis

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DURING THE PAST twenty-six years, the California Agricultural Experiment Station has centered research on bovine brucellosis around the basic problems of immunity and shedder conditions in relation to various methods of controlling the disease. Attempts at artificial immunization at first consisted of the injection of virulent organisms into cows from three to six weeks before breeding. This procedure established a solid immunity against severe challenging infection but had the disadvantage of producing chronic carriers and eliminators of virulent infection. This method, also objectionable for other reasons, was finally abandoned in favor of control methods based on the use of the agglutination test. The idea of looking toward the possibility of controlling Brucella infection through the use of an immunizing agent came again after experience had clearly demonstrated that test and slaughter, test and segregation, or test and gradual elimination programs were not, in themselves alone, the answer to the successful control of bovine brucellosis, at least under the conditions found on numerous farms throughout the state where data were available for a decade or more. It was felt that, under California conditions, the elimination of infected individuals would not suffice to control the disease, and that a sounder approach to the problem entailed the initiation of protection within the individual animal by a method which would supplement and fortify natural resistance or immunity.

It has been demonstrated, however, that brucellosis can be controlled by test and segregation under certain conditions. One coöperating dairy has proved to be a good example. This herd of approximately 200 milking cows was found to contain 21 positive reactors in 1924. These animals were removed from the milking herd, as were all new positives which appeared, some being slaughtered and others milked and cared for separately. By early 1925, the main herd was completely negative and remained in that status without vaccination until 1939, when it was decided to begin a calfhood vaccination program which has been very successful. A comparable instance of success also occurred under a test and gradual elimination program in a 350-cow dairy, whereby advantage was taken of the self-limiting tendency of the disease and only those reactors were eliminated which were of poor or mediocre production. After four years, a herd completel, free of reactors was obtained. The experience which these and some smaller herds offered led to the belief that brucellosis could be controlled by such methods. This conviction persisted until additional and more extensive use of these methods demonstrated that they more frequently fail than succeed, at least under California conditions.

The use of strain 19 under controlled experimental conditions at Berkeley and also in coöperative dairies and beef ranches has been in progress for thirteen years. Results have been remarkably good and, in most cases, far better than originally expected. For instance, the protection afforded by vaccination has been sufficient in some cases to entirely eliminate *Brucella abortus* infections.

Despite the successful use of strain 19 in many instances, it is quite apparent that the ideal in immunization is not approached in the average vaccination program. Several factors remain as important obstacles to an over-all program aimed at the eventual eradication of brucellosis. The fact that several of the most important milk-producing states are at present undertaking large-scale, strain 19 vaccination makes it especially urgent that a reconsideration be made of what is now known about strain 19 vaccination in order that the maximum possible benefits may be derived from its use.

First and very important, we encounter the problems presented by the vaccine itself. Strain 19 is not the ideal immunizing agent. It would be foolish to claim that it is, and

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no such claims are made by those familiar with its use. Extensive research is in progress for something better, but until that "something better" is discovered, tried, and proved, the fact that strain 19 has been shown to be the most efficient immunizing agent now available warrants its continued use. Recognition of certain of its weaknesses, however, should aid in its more effective use.

The fact that strain 19, like various other organisms, is capable of existing in several variant forms having differing immunizing values, presents rather formidable problems incident to vaccine manufacture. The so-called smooth, or highly antigenic, type is at present considered the most desirable for vaccine production. Irregularities in technique, in the culture mediums used, and the dissociative potentialities of various substrains are all factors influencing the possible dissociation of vaccine serials and warrant the constant supervision of specially trained personnel in order to insure the production of high quality vaccine free from antigenically undesirable variants.

Strain 19 vaccine is a suspension of live organisms in 0.85 per cent sodium chloride solution. The fact that these bacteria are alive and maintained in a medium supplying no nutrient material makes the vaccine a highly perishable product that is subject to deterioration by handling under adverse conditions. An important percentage of so-called "vaccine failures" may well be due to the injection of dead or inactive organisms into the animal vaccinated. It must be impressed upon those handling the vaccine that the object of its administration is the initiation within the animal of a type of "strain 19 infection" of low virulence. This, of course, cannot be done with dead organisms, the use of which has been abandoned in vaccination. The U. S. Bureau of Animal Industry vaccine standards are designed to insure adequate potency until expiration date. During shipment, or due to a long period of storage in drug stores and other local distributing centers, injurious changes may occur. For this reason, the California legislature has empowered the state Department of Public Health to test biological products and enforce proper transport and storage methods. A recent survey conducted by that department showed 75 per cent of all vaccine samples collected from drug stores throughout the state to be below standard. Recognition must be made of the fact that this fragility of strain 19 renders it a product which is not adapted to non-professional use. The veterinarian should also be cognizant of the fact that the vaccine is highly susceptible to extremes in temperature and under no circumstances should be used after the expiration date, despite the fact that vaccines in some cases have been shown to be within the standard requirements after expiration. The practice at the University of California is to conduct periodic determinations during storage in order to establish the concentration of viable organisms present in each serial lot of vaccine. As a particular lot approaches its expiration date and the viability decreases, the volume of vaccine injected is increased to keep pace with the decrease in potency. The practitioner or field man using commercial strain 19 vaccine does not have this opportunity to check periodically on the quality of the product he is using. It is, therefore, even more important that he should pay particular attention to the proper handling and refrigeration of this material until it is actually injected into the animal.

Equally as important as the proper production and care of the vaccine is the determination of an effective policy for its use in the field. There is now reason to believe that improvements can be made in the use of the vaccine by a reconsideration of the ages for its administration.

The commonly recommended age for the vaccination of heifer calves is 4 to 8 months. It is admitted that vaccination at this age is desirable in that, in most cases, the recession of postvaccination agglutination titers is complete at the time of the first parturition. As far as the relative resistance produced in the animal is concerned, however, calfhood vaccination at such an age is apparently not completely efficient. Controlled experiments in our animals have definitely shown that the response to the vaccine by animals of that age group is incomplete. As reported by the writers at the 1943 meeting of the United States Live Stock Sanitary Association, animals vaccinated at ages approaching and subsequent to sexual maturity show a definitely more positive resistance to infection. It is rather questionable if an animal vaccinated as early as 4 months of age develops resistance sufficient to protect against field exposure at periods two years and longer after

vaccination. Because of the definitely better results obtained from the vaccination of somewhat older heifers, most calfhood vaccination carried out in dairy herds coöperating with the University of California is done at ages ranging from 7 to 12 months. The recession of postvaccination titers in such animals is, on the whole, quite satisfactory by the time of the first parturition. For example, of 295, 2-year-old heifers in our Del Norte County experimental group which had freshened by May 15 of this year (1946) and which had been previously vaccinated at 7 to 12 months of age, only 27 (9.1%) were positive blood-test reactors. These results were obtained in herds where varying levels of infection prevailed. It is, therefore, logical to assume that some of the positive blood-test reactions represented cases of virulent infection, rather than the persistence of postvaccination agglutinins.

TABLE 1—Total Vaccinated Animals Tested to June 14, 1946—1,554

Group	No. tested	Negative	Suspicious	Positive
9—Born 1939 Vacc. 1940-41 at 24-29 mos.	225	198	25	2
0—Born 1940 Vacc. 1941 at 12 mo.	182	181	1	0
1—Born 1941 Vacc. 1941-42 at 10-16 mo.	244	235	8	1
2—Born 1942 Vacc. 1943 at 15 mo.	214	192	20	2
3—Born 1943 Vacc. Nov. 1944 at 21 mo.	419	389	29	1
4—Born 1944 Vacc. Nov. 1945 at 21 mo.	270	145	105	20
Total	1,554	1,340	188	26

Experience with the immunization of heifers in herds of beef cattle, whose owners coöperate with University of California veterinarians, has been that vaccination at even older ages has proved satisfactory. In one herd of approximately 3,300 range cows, the vaccination of older heifers has been carried on since 1940 with good results, as far as protection to the animal and the recession of blood titers are concerned. The results on all vaccinated animals tested to date this year are shown in table 1.

The animals in group 3 are particularly interesting. Of 419, only 1 positive reactor remained approximately eighteen months after vaccination. Since it is known that a low level of infection exists in this herd, it is quite reasonable to assume that this animal, as well as some of the other persistent reactors, might quite well be infected. Group 4 is also of interest since, of 270 vaccinated, only 20 (7.4%) remained positive reactors approximately six months after vaccination.

In those cases where vaccination has been carried out at ages approximating the upper limit of the 4- to 8-month age commonly recommended for calfhood vaccination, the recession of postvaccination titers has been very satisfactory. In one large coöperating dairy, for instance, 814 first-calf heifers freshened during 1944 and 1945. All of these animals had been previously vaccinated at approximately 7 months of age and had grown to maturity on brucellosis-free premises away from any contact with adult cattle. At the time of their first parturition, 741 of these animals (91%) were negative to the blood-serum agglutination test. An additional 69 (8.5%) were suspicious, and only 4 (0.5%) were positive. Of these 4 positive animals, none exceeded 1 : 100 in blood titer.

The resistance to Brucella infection produced by the vaccination of adult cows has been shown to be more solid than that resulting from vaccination in calfhood. It has, therefore, been the policy at the University of California for several years to use unhesitatingly strain 19 vaccine on adult cattle in herds experiencing or threatened by so-called "abortion storms." In such cases, all cattle negative to the agglutination test and not advanced more than four months in pregnancy are vaccinated, the idea being to create a resistance in those cattle not yet infected. Since the results have been uniformly good, the writers wish to go on record as strongly favoring the vaccination of adult cattle under such circumstances. The vaccination of such animals is intended primarily as a protective measure.

The vaccination of agglutination test reactors is apparently of doubtful value. Data derived from the vaccination of several hundred such animals show there was no appreciable difference in the subsequent calving records of vaccinated and unvaccinated reactors. It would seem, however, that the persistence of agglutination titers is more prolonged in vaccinated reactors than in the case of animals allowed to recover unmolested.

The whole question of adult vaccination has been debated at some length in both veterinary and lay journals. It has one outstanding disadvantage—the variable persistence of a postvaccination agglutination titer which largely confuses the interpretation of blood-serum agglutination test results for a considerable period of time following vaccination. Differentiating blood-serum reactions produced by vaccination from those caused by virulent infection is difficult, but this is now being investigated at the California station, utilizing several approaches, and it is expected that information will be released in the near future which will materially aid in solving this problem. For example, one aspect of this work to date has indicated that the persistence of agglutinins following vaccination is much more short-lived in the milk than in the blood, and has tended to indicate that the milk serum or whey agglutination test will be of value in the diagnosis of virulent infection in vaccinated animals and, therefore, in differentiating the two types of blood test reactions,

There has been some talk of causing abortions and spreading brucellosis by the use of strain 19 in adult cattle. Perhaps, the factor most responsible for these reports is a lack of familiarity with the action and virulence of strain 19. Abortions directly attributable to strain 19 have occurred, although very rarely. In fact, publications of the University of California station were among the first to report such an occurrence. However, no proof is yet available that infection has occurred in any animal associated with a cow aborting from, or otherwise contaminated by, strain 19.

A situation which commonly results in the criticism of adult vaccination because of its supposedly causing abortion is the vaccination of animals which are already infected. It is known that the incubation period in field Brucella infections is of fairly long duration and that the diagnosis of infection by the agglutination test may not be made until some time after the entrance of the virulent organisms into the animal body. Hence, a cow may be vaccinated with strain 19 during the incubation period of the virulent infection. Such an occurence is not rare in infected herds. Some time later, abortion occurs and the common mistake is to blame the vaccination for the abortion. Bacteriologic examination of the aborted fetus in such cases invariably results in the isolation of field strains of *Br. abortus* and not strain 19.

Abortions in some cases may occur because of the indirect action of the vaccine. There often is a systemic reaction to vaccination in adult cattle, including a febrile response, some tendency to go off feed, and a temporary drop in milk production, although this is not constant. A pregnant cow possessing a genital tract diseased because of trichomonad, vibrionic, or other infection, may not be able to withstand this systemic reaction. A break occurs at her weakest point, namely, the diseased genital tract, and abortion occurs. Strain 19 cannot be directly condemned for such abortions.

In California, vaccination carried out prior to the fifth month of pregnancy has rarely resulted in abortion. Apparently, the fifth and sixth months of pregnancy constitute the most dangerous period in this regard and vaccination later in pregnancy has no practical protective value in that gestation. Of interest, however, may be the fact that limited experience has given some reason for the belief that vaccination subsequent to the beginning of the eighth month of pregnancy may be safe enough, but work on this phase of vaccination has not been extensive enough to warrant any definite conclusions. In 1 case, however, a cow vaccinated on the 253rd day of pregnancy gave birth to a weak calf, from which strain 19 was isolated after slaughter. The maternal placenta showed extensive necrosis typical of brucellosis and yielded strain 19 on culture, as did the colostrum.

The question of the revaccination of adult animals in both clean and infected herds has become increasingly important of late. It does seem that it is expecting too much to ask that a lifelong resistance will be produced by the vaccination of a heifer at an age when it is least susceptible to brucellosis and least able to develop an immunity to Brucella infection. There is no question that the resistance produced by calfhood vaccination is not solid, and that a particularly virulent infection will overcome this resistance in a varying percentage of cases. This fact is becoming a very important consideration in herds where infection is known to exist. In addition, a definite demand for revaccination is coming from the dairy industry, particularly from the dairyman who has, after years of vaccination, finally arrived at the point where he has a

clean herd. The knowledge and fear, often based on personal experience, of the terrific damage resulting from the introduction of infection into a clean but highly susceptible group of cattle established by a test and slaughter or test and segregation program sponsors an uneasiness over the possession of negative cattle, even though they might have been vaccinated in calfhood. The request for revaccination almost becomes a demand in such cases.

Field trials in revaccination are in progress at present in coöperation with several cattle owners, and the preliminary results seem favorable. The practice in these herds is to vaccinate heifer calves at approximately 10 to 12 months of age and to revaccinate soon after the first parturition. It would seem that such a procedure develops the maximum protection possible from strain 19 vaccine. The question of revaccination undoubtedly warrants further consideration, especially in view of the increasing demand for this service from the dairy industry.

SUMMARY

1) The resistence produced by strain 19 vaccination may be overwhelmed by exposure to massive field infections.

2) Strain 19 cannot be considered an ideal immunizing agent. Research is still being directed toward the development of an improved product.

3) Despite its limitations, strain 19 has been shown to be of definite value as an aid in the control of *Brucella abortus* infection.

4) As a suspension of live organisms in physiologic saline solution, the vaccine is a fragile product, subject to deterioration.

5) Vaccination at ages approaching and subsequent to sexual maturity is relatively more efficient.

6) In California, it has been found that the vaccination of heifers at older ages than is commonly recommended is followed by a satisfactory recession in postvaccination blood titers in most cases.

7) Vaccination of negative adult cows is an effective means of heading off abortion storms and is to be recommended.

8) The problem of differentiating agglutination-test reactions produced by infection from those produced by vaccination now seems less formidable in view of impending developments, although definite conclusions cannot be drawn in this regard until additional work is done under practical conditions.

9) Revaccination, as adults, of animals previously vaccinated as heifers seems worthy of further consideration.

HCH (=Hexachlorocyclohexane)

HCH (H. C. H. in some reports), first made in Great Britain in 1925 and discovered to be a powerful insecticide in France in 1941, is described to be better in all essential respects than DDT by Dr. J. Guilhon (*Rec. de Méd. Vét., 122,* Sept., 1946: 385-407), who gives the full account of its preparation, physical and chemical properties, toxicity in man and animals, methods of application, comparisons with DDT, and its dynamics against insects and other invertebrates. Its stability is excellent, insecticide property high, and therapeutic uses numerous. Fish and guinea pigs are relatively sensitive to its action, while the skin of man and the domestic animals is very tolerant. HCH is more polyvalent than DDT and less toxic. An objection is its disagreeable and lasting, musty odor. In solution, emulsion, or powder suspension, it is used at a dilution of 1 to 15 per cent.

Listerellosis in Ohio

Listerellosis in farm animals has been reported as present in many states in recent years and probably has been observed in others, even though not officially reported. The latter is the case in Ohio. In a report recently published, it was truthfully stated that this disease had not been heretofore reported in Ohio[1].

However, this disease was observed in Ohio some years ago and caused considerable losses in at least one flock of sheep. This flock was examined in the early summer of 1942 following repeated losses. At that time, the etiologic agent was isolated from the brains of some of the lambs which died during the outbreak and positively identified as *Listerella monocytogenes.* The symptoms indicated disturbances of the central nervous system. The period of the year and other pertinent information closely resembled that described for similar losses by New York and Illinois observers. *—W. D. Pounden, D.V.M., B. H. Edgington, M.D.C., D.V.M., Ohio Agricultural Experiment Station, Wooster, Ohio.*

[1]Cole, C. R.: Listerellosis in a Hereford Cow. J.A.V.M.A., *109,* (1946): 217.

A Clinical Evaluation of Sulfamerazine in Infections of Cattle

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DURING RECENT years, much progress has been made in the development of new and improved chemotherapeutic agents. Sulfonamides are the group of new compounds that have found the widest field of usefulness in veterinary practice. According to published data, several thousand sulfonamide compounds have been prepared; however, relatively few were found to be particularly useful in medicine.

To be worthy of clinical trial, a new compound should show promise, when compared with established drugs, of having less toxicity, a greater range of therapeutic activity, and efficacy in smaller dosage or identical dosage at less frequent intervals. The medical literature and personal communications from colleagues indicate that sulfamerazine possesses at least some, if not all, of these properties and thus should prove of interest.

Sulfamerazine (4-methyl-2-sulfanilamidopyrimidine) is a monomethyl derivative of sulfapyrimidine. It is a white crystalline powder and is very sparingy soluble in water. The sodium salt, however, readily dissolves in this medium. Sulfamerazine has been used experimentally and clinically in the treatment of infections due to pneumococci, meningococci, hemolytic streptococci, and gonococci. This compound is absorbed readily from the intestinal mucosa, and high blood concentrations are attained rapidly. Moreover, the excretion of sulfamerazine is slower than that of sulfadiazine, sulfathiazole, or sulfapyridine; this property permits maintenance of high blood levels for a prolonged period with less drug, or with less frequent administration of a given dose. These characteristics, particularly less frequent administration, are of practical and economic importance to the veterinarian. Finally, the range of bacterial specificity and the order of toxicity of sulfamerazine are quite similar to those of sulfadiazine.

Thorp[1] reported that sulfamerazine was of value in the treatment of pneumonia in calves and observed that the dosage required was less than that of the other common sulfonamide drugs. He indicated also that this compound was well tolerated by calves and was relatively nontoxic when administered in therapeutic amounts.

The conclusions of Thorp together with the unique pharmacologic characteristics of sulfamerazine stimulated our interest in using this agent clinically in the treatment of certain diseases of immature and adult cattle. It should be revealed at the outset that no untreated controls were maintained. From a scientific standpoint, this is to be deplored but, for benevolent and economic reasons, it is often impossible

TABLE I — Pneumonia in Calves Treated with Sulfamerazine

Animals				Body temp. on initial examination	Treatment			Results	
No.	Breed*	Sex	Age	(F.)	1st day	2nd day	3rd day	Rec.	Died
1	G	F.	11 days	105.8	8 Gm.	8 Gm.	.....	1	
1	H	F.	5 days	106.0	8 Gm.	4 Gm.	4 Gm.	1	
1	H	F.	3 mo.	104.5	8 Gm.	4 Gm.	4 Gm.	1	
1	H	F.	3 mo.	105.0	8 Gm.	4 Gm.	4 Gm.	1	
3	H	F.	4 mo.	103.0 to 106.0	8 Gm.	4 Gm.	4 Gm.	3	
1	G	F.	4 mo.	....	8 Gm.	4 Gm.	4 Gm.	1	
1	H	F.	6 mo.	104.0	16 Gm.	8 Gm.	8 Gm.	1	
1	H	F.	4 mo.	104.0	8 Gm.	4 Gm.	4 Gm.	1	
3	H	F.	8 mo.	103.0 to 106.0	10 Gm.	8 Gm.	6 Gm.	3	
1	Her.	F.	4 wk.	105.0	8 Gm.	12 Gm.	4 Gm.	1	
1	H	F.	4 mo.	104.0	8 Gm.	8 Gm.	.....	1	
Total	15							15	None

*=Guernsey. H=Holstein-Friesian. Her.=Hereford.

in veterinary practice to deny an animal and its owner the benefits of medication and skilled care. It is the opinion of the authors that many of the animals in this series would have succumbed or would have remained unthrifty had treatment been denied.

PNEUMONIA IN CALVES

Usually this condition is encountered in our practice during the winter and spring months. Inadequate and improper stable facilities undoubtedly are predisposing factors; however, we find this condition frequently among calves on well-equipped and well-maintained farms.

Table 1 presents data relative to the treatment of pneumonia in a series of 15 calves. Upon initial examination, the animals exhibited the usual symptoms of pneumonia as manifested by fever, congestion of the ocular mucous membranes, depression, rapid labored breathing, dyspnea, and anorexia. Temperatures ranged from 103 to 106 F.. In our opinion, the diet was adequate and proper. The younger calves

TABLE 2 — Hemorrhagic Septicemia and Pneumonia in Cattle Treated with Sulfamerazine

Animals				Body temp. at time of examination (F.)	Diagnosis	Remarks	Treatment			Results	
No.	Breed*	Sex	Age				1st day	2nd day	3rd day	Rec.	Died
1	Her.	M	8 mo.	106.	H.S. ‡ and pneumonia	[1]	16 Gm.	16 Gm.	.....		1
1	Her.	M	8 mo.	105.	Pneumonia		40 Gm.	20 Gm.	20 Gm.	1	
3	Her.	M	18 mo.	107.	H.S. and pneumonia	[2]	32 Gm.	16 Gm.	.....	2	1
1	H	F	2 yr.	107.	H.S. and pneumonia	[3]	30 Gm.	.....	.....	1	
1	G	M	2 yr.	105.	H.S. and pneumonia	[4]	8 Gm.	4 Gm.	.....	1	
1	G	F	4 yr.	106.	H.S. and pneumonia	[4]	8 Gm.	4 Gm.	.....	1	
5	G	F	5 to 6 yr.	105. to 108.	H.S. and pneumonia	[5]	20 Gm.	10 Gm.	10 Gm.	5	
1	G	F	9 yr.	105.	Pneumonia	[6]	24 Gm.	24 Gm.	12 Gm.	1	
1	H	F	5 yr.	106.	H.S. and pneumonia	[3]	35 Gm.	.....	.....	1	
1	G	F	5 yr.	105.	Pneumonia	[7]	16 Gm.	8 Gm.	8 Gm.	1	
1	G	F	4 yr.	105.	Pneumonia	[4]	40 Gm.	.....	.....	1	
1	H	F	9 yr.	106.	Pneumonia		40 Gm.	40 Gm.	.....	1	
1	H	F	9 yr.	106.	Pneumonia	[8]	40 Gm.	40 Gm.	.....	1	
1	H	F	2 yr.	105.	Pneumonia	[8]	40 Gm.	40 Gm.	.....	1	
1	H	F	4 yr.	104.	H.S. and pneumonia		40 Gm.	.....	.....	1	
1	G	F	5 yr.	105.	Pneumonia		40 Gm.	30 Gm.	.....	1	
1	H	F	5 yr.	107.	Pneumonia	[9]	40 Gm.	40 Gm.	20 Gm.	1	
Total	23									21	2

*Her.=Hereford. H=Holstein-Friesian. G=Guernsey. †=Tr. Gentian. Tr. Iron Citro-chloride. Cobalt chloride. Aromatics. ‡=Hemorrhagic septicemia.

[1]120 cc. hemorrhagic septicemia anti-serum administered on first day of treatment. [2]These animals were shipped recently by railroad from range country. [3]7 cc. hemorrhagic septicemia bacterin on first day. Animal eating well on second day. [4]Tonic† was administered t.i.d. [5]Each animal received 100 cc. hemorrhagic septicemia anti-serum on first day of treatment. [6]Phlegmon in anterior cervical region appeared on second day. Local treatment also applied. [7]Phlegmon in anterior cervical region. Local treatment also applied. [8]Second day the amount of drug was divided in two equal doses at 12-hr. intervals. [9]Body temperature on second day of treatment was 102.8 F.

had nursed their dams or were fed milk from them. The larger calves were given calf meal or pellets and good quality alfalfa or mixed hay. Treatment on the first day consisted of the administration of sulfamerazine* in tablet or powder form as a drench at the rate of about 0.15 Gm. per kilogram (approximately 1 gr. per lb.) of body weight in one dose to 2 calves and to the others in two equal doses. On the following two days, the majority of the animals received one-half of the initial dosage in one or two equal doses. It was not necessary to treat any of these calves for more than three days. In most of the animals, the temperature returned to normal within twenty-four hours after treatment was started and the animals again ate and drank. Body temperatures of all the animals were not determined after treatment was instituted, since objective improvement, in most cases, was sufficient evidence of a satisfactory response. Ventilation in the stables, if not suitable, was corrected. No other treatment was utilized.

*The sulfamerazine for this study was furnished by the Medical Research Division of Sharp and Dohme, Inc., Glenolden, Pa.

PNEUMONIA OR HEMORRHAGIC SEPTICEMIA COMPLICATED BY PNEUMONIA

Table 2 presents data collected from a group of 23 mature or nearly mature cattle suffering with pneumonia or the hemorrhagic septicemia-pneumonia syndrome. All the animals were treated with sulfamerazine.

These cases arose following transport by truck or railroad or, in a few instances, in members of herds to which newly acquired

TABLE 3 — Metritis in Cows Treated with Sulfamerazine

No.	Animals Breed*	Age	Body temp. on initial examination (F.)	Diagnosis	Remarks	Treatment 1st day	Treatment 2nd day	Treatment 3rd day	Results Rec.	Results Died
1	G	6 yr.	104.0	Metritis and septicemia	[1]	16 Gm.	8 Gm.	8 Gm.	1	
1	G	5 yr.	105.4	Metritis and septicemia	[2]	40 Gm.	40 Gm.	....	1	
1	H	4 yr.	104.0	Metritis and septicemia		40 Gm.	20 Gm.	....	1	
1	H	3 yr.	106.0	Metritis and septicemia		40 Gm.	....	....	1	
1	G	3 yr.	105.8	Metritis and septicemia		40 Gm.	40 Gm.	....	1	
1	H	8 yr.	106.0	Metritis and septicemia	[3]	40 Gm.	40 Gm.	....	1	
1	G	4 yr.		Retained placenta	[4]	113 Gm. (¼ lb.) sulfamerazine powder distributed in uterine cavity.			1	
1	H	3 yr.	102.0	Retained placenta	[5]	40.0-0.5 Gm. sulfamerazine tablets distributed in uterine cavity.			1	
1	H	4 yr.	102.0	Retained placenta	[6]	113 Gm. (¼ lb.) sulfamerazine powder placed in uterine cavity.			1	
Total 9									9	None

[1]Administered 40 mg. stilbestrol on first day of treatment. [2]Administered 20 mg. stilbestrol on first day of treatment. [3]Retained portion of placenta removed manually on the second day. [4]Retained portion of placenta removed manually prior to administration of sulfamerazine powder. [5]Three days after treatment removed retained portion of placenta. Very little offensive, putrid odor. [6]Sulfamerazine powder was distributed in uterine cavity immediately after manually removing the placenta. Cow never missed a meal.

*G=Guernsey. H=Holstein-Friesian.

animals had been added. The sick animals presented clinical symptoms of pneumonia or of the hemorrhagic septicemia-pneumonia syndrome. In most instances, the animals were on pasture or were housed in stables under satisfactory conditions of ventilation and sanitation.

Since, previously, we had experienced such excellent results with sulfamerazine in the treatment of calf pneumonia, we were anxious to use the same agent in the treatment of similar conditions in older cattle. The dosage employed, in most instances, was about 0.075 Gm. per kilogram (approximately 1/2 gr. per lb.) of body weight administered in one dose on the first day. The majority of the animals received one-half of this amount daily during the subsequent two days of treatment. Six of the animals received 100 to 120 cc. of hemorrhagic septicemia antiserum on the first day. One of these animals succumbed on the following day, but this had been anticipated since it was moribund when first seen. Two animals received 7 cc. of hemorrhagic septicemia bacterin on the initial day of treatment. Two cows each developed a severe and extensive phlegmon in the anterior cervical region on the second day of treatment. Counter-irritants and hot packs eliminated this condition and a satisfactory recovery ensued.

RETAINED PLACENTA AND ENDOMETRITIS

Table 3 presents data from 9 cases of retained placenta with uterine infection in cows. This condition was complicated by septicemia in 6 of the animals, as indicated by fever, anorexia, and depression. Several cows had a brownish, purulent, foul-smelling vaginal discharge. In each case, parturition had occurred twenty-four to seventy-two hours prior to the time of the first visit and examination. On the first day of treatment, 6 of the 9 cows received sulfamerazine orally in the amount of 0.075 Gm. per kilogram (approximately 1/2 gr. per lb.) of body weight. The following day, the same dosage was employed for 3 of the 6 cows, while 2 received only one-half this amount. The other appeared so improved that no further treatment was considered necessary. In each case, the retained portion of the placenta was removed manually on the first or second day of the treatment.

The remaining 3 cows did not show signs of septicemia at the time of examination. Following removal of the placenta,

TABLE 4 — Septicemia Associated with Bovine Mastitis Treated with Sulfamerazine

	Animals		Body temp. on initial examination		Treatment			Results	
No.	Breed*	Age	(F.)	Remarks	1st day	2nd day	3rd day	Rec.	Died
1	G	5 yr.	105.0	[1]	40 Gm.	20 Gm.	....	1	
1	H	7 yr.	106.4	[1]	40 Gm.	20 Gm.	....	1	
1	H	9 yr.	104.0	[2]	40 Gm.	....	....		1
1	H	8 yr.	105.4	[3]	40 Gm.	....	....		1
1	H	8 yr.	107.0		40 Gm.	....	....	1	
1	H	8 yr.	103.0	[4]	40 Gm.	40 Gm.	40 Gm.		1
1	H	6 yr.	105.0		40 Gm.	....	40 Gm.	1	
1	H	7 yr.	106.8	[5]	40 Gm.	....	....	1	
1	G	10 yr.	104.0	[6]	16 Gm.	8 Gm.	8 Gm.	1	
1	H	7 yr.	106.0	[7]	16 Gm.	8 Gm.	8 Gm.		1
1	J	4 yr.	105.0	[8]	16 Gm.	8 Gm.	8 Gm.	1	
Total 11								7	4

*G=Guernsey. H=Holstein-Friesian. J=Jersey.

[1]Administered 60 cc. sulfanilamide-in-oil (30%) into each quarter on the first day of treatment. [2]Animal sick for five days. Died five hours after treatment. [3]100,000 units of penicillin in 100 cc. saline solution infused into each quarter on second day. Cow died on the third day. [4]Severe gangrenous mastitis. [5]Infused into each quarter 80 mg. of tyrothricin in mineral oil emulsion on first day. 200,000 units penicillin in saline solution second day. [6]Animal recovered from septicemia but milk was abnormal and animal was not returned to milking line. [7]Died with gangrenous mastitis on fourth day. [8]Affected quarter drained by surgical procedure. Animal recovered and was slaughtered three weeks later.

113 Gm. (1/4 lb.) of sulfamerazine powder and, in the case of 1 cow, 20 Gm. of the compound was applied to the endometrium. An attempt was made to distribute the powder thoroughly. No offensive or fetid odor was noticed following treatment.

SEPTICEMIA ASSOCIATED WITH ACUTE MASTITIS

Table 4 presents the results of sulfamerazine therapy in 11 cases of septicemia associated with acute mastitis. This condition invariably is refractory to treatment: (1) because most cases are seen late and (2) because a focus of infection usually persists in the mammary tissue. It is believed that septicemia as a sequel of mastitis is due to toxin-producing organisms.

Two of the 11 cows with temperatures of 105 F. and 106.4 F., respectively, were given 40 Gm. of sulfamerazine in one dose on the first day and 20 Gm. on the following day. Sixty cubic centimeters of sulfanilamide in oil (30%) was administered into each quarter on the first day of treatment. These 2 cows did not eat on the first and second days after treatment but improved rapidly thereafter.

Three additional cows with acute mastitis were treated by oral administration of 16 Gm. of sulfamerazine on the first day and one-half this amount during each of the following two days. These cows were milked four times a day in order to remove any accumulated secretion and toxin. Drainage of a quarter was established by surgical procedure in 1 cow. Two of the 3 animals recovered from the septicemia and toxemia; however, the udders were abnormal and the milk was unfit for human use. These 2 animals were later sent to slaughter. The other animal succumbed on the fourth day after treatment was instituted.

The remaining 6 of the 11 cows in this

Chief Livestock Sanitary Officials

Assembly of Chief Livestock Sanitary Officials of the various states attending the special meeting on Livestock Sanitary problems at the general office of Swift & Co., Chicago, Ill., on Dec. 3, 1946. Luncheon was served before the meeting.

First row (left to right)—Dr. R. M. Gow, Colorado; Mr. Will J. Miller, Kansas; Dr. R. A. Hendershott, New Jersey; Dr. William Moore, North Carolina; Dr. T. B. Clower, Georgia; Mr. Sam McCue, New Mexico; Dr. G. H. Good, Wyoming; Dr. J. R. Snyder, Nebraska; and Dr. H. C. Givens, Virginia.

Second row (left to right)—Dr. C. E. Fidler, Illinois; Mr. Lon Merchant, New Mexico; Dr. George A. Rathman, Kansas; Dr. C. E. Kord, Tennessee; Dr. R. E. Foote, Connecticut; Dr. H. F. Wilkins, Montana; Dr. R. L. West, Minnesota; Dr. J. V. Knapp, Florida; Dr. W. H. Shannon, Massachusetts; Dr. F. G. Buzzell, Maine; Dr. R. S. Robinson, South Dakota; Dr. C. P. Bishop, Pennsylvania; Dr. C. C. Franks, Iowa; Dr. H. A. Tripper, Washington; Dr. H. C. Simmons, Mississippi; Dr. A. K. Carr, California; Dr. H. McDaniel, Jr., Delaware; and Dr. I. S. MacAdory, Alabama.

Third row (left to right)—Mr. Don E. Kenney, Utah; Dr. Hugh E. Curry, Missouri; Dr. Ivan G. Howe, New York; Dr. C. F. Clark, Michigan; Dr. A. L. Brueckner, Maryland; Dr. W. G. Hastings, Sr., Maryland; Dr. T. C. Green, West Virginia; Dr. T. O. Brandenburg, North Dakota; Dr. C. E. Botkin, Indiana; and Dr. D. C. Hyde, Ohio.

series each received 40 Gm. of sulfamerazine on the first day. This dosage was repeated for two days in 1 case and, in another, a second dose was administered two days after treatment was begun. One of the 6 cows also received 80 mg. of tyrothricin suspended in mineral oil in each quarter on the first day and 200,000 units of penicillin in saline solution on the second day. Three of these animals recovered, returned to the milking line, produced milk that was negative to the bromthymol blue test, and was normal in appearance.

The other 3 of the 6 cows in this group had exhibited a severe gangrenous mastitis associated with acute septicemia for several days prior to treatment. Each received 40 Gm. of sulfamerazine in one dose on the initial day of treatment. One of these animals died five hours after treatment began. The second cow received 100,000 units of penicillin in saline solution on the second day of treatment but succumbed during the next twenty-four hours. The third cow received 40 Gm. of sulfamerazine daily for three days but died in spite of treatment.

SUMMARY

The data presented in this paper demonstrated that sulfamerazine is an effective and safe chemotherapeutic agent when used in the treatment of pneumonia, hemorrhagic septicemia, and septicemia associated with metritis and mastitis in cattle.

The data also substantiate the observation of Thorp that small doses of sulfamerazine are as effective in pneumonia in calves as larger doses of other sulfonamides. The response to sulfamerazine was more rapid and the period of treatment shorter than with other sulfonamides.

It appeared that the dosage required to treat pneumonia in cattle, calculated on a body weight basis, is smaller for heavy animals in good condition than for underweight animals in a poor state of nutrition.

Reference

[1]Thorp, W. T. S.: The Newer Sulfonamides in Veterinary Practice, J.A.V.M.A., *106* (1945): 75-82.

Pendulous crop, or cropbound, is an inherited condition. The only successful treatment is individual operation. It is likely to recur.

Cure for Heaves (=Equine Pulmonary Emphysema)

A complicated chemotherapy said to have been useful in the treatment of human asthma is reported by Cantonnet (M.D.) and Fouchier (D.V.M.) (*Bull. Acad. Vét. de France, 28,* (Jan., 1945): 194-804) to be giving important results in heaves which, since time out of mind, has been erroneously called pulmonary emphysema — a fancy name for a common ailment.

Dr. P. Cantonnet is a physician of Paris and Dr. J. Fourchet is a veterinarian of Saint Maxient. Their work was analyzed and published by *L'Académie vétérinaire de* France during the war and, therefore, escaped general attention. It is described here without comment.

The treatment consists of intravenous injections of octanol (primary octylic alcohol), hyposulphite of magnesium and chloride of calcium associated with subcutaneous injections of iodated polyvalent peptone and autohemotherapy. The treatment is given daily for fifteen days. Heaves is a grave, disabling affliction of middle and old life and is no respecter of kind or breed. It has been used by the senior author in human asthma since 1927 in the course of trials of iodated polypeptones for the relief of that spasmodic ailment.

The dynamics of each ingredient, critically analyzed, appears to confirm the authors' contention. Roughly stated, *peptone* is antishock intravenously through its mithridatism of the blood; the action of *iodine* on lymphoid tissue, sclerosis, secretions, and excretion is well known; *calcium chloride* is orthosympathotropic; *hyposylphite of magnesium* is antispasmodic and with the calcium restores the nervous dysequilibrium; *octanol* reinforces the heart through the elimination of chlorides; and the autohemotherapy supports the antishock action of the peptone. Thus, the integrated therapy is explained.

The results obtained in 4 cases of grave heaves in advanced adult life, minutely described in the report, were little less than phenomenal.

Turkey poults 5 to 10 days old often shrink in size, lose weight, and die as a result of failure to learn to drink, according to workers at the Animal Disease Station, Beltsville, Md.

Occurrence of Trichomonas Foetus in Preputial Samples from Infected Bulls

Relation to, and Application in, Diagnosis

DAVID E. BARTLETT, D.V.M., ELEANOR V. HASSON, B.A., and KEITH G. TEETER, B.A.

Beltsville, Maryland

THE PROBLEM of determining the status of an individual bull—whether he harbors *Trichomonas foetus* or is free from infection—is frequently encountered in bovine venereal trichomoniasis control. Definite diagnosis of the presence of this infection is necessarily based upon demonstrating the etiologic agent in genital secretions of the bull or in the genital secretions of a female with which only the bull in question has had recent coitus. Conversely, definite diagnosis of freedom from infection must be based upon consistent absence of *T. foetus* from the genital secretions of the bull and, ideally, upon freedom from infection of susceptible females with which the bull in question has had coitus.

In a previous paper, some factors governing the presence or absence of *T. foetus* in the vagina of females and the appropriate times for collection of vaginal samples have been discussed.[1,2] It is the primary purpose of this paper to present experimental data relative to the incidence of *T. foetus* found on examination of preputial samples collected from bulls known to be infected. Efficacy and limitations of the method employed as a practical diagnostic procedure will be discussed. The secondary purpose of this paper is to record cases of *T. foetus* infection in 2 bulls which seem atypical in comparison with other infections which have been studied.

Experimental Procedure

Ten bulls, all infected with *T. foetus*, were studied in these experiments; their respective breeds, dates of birth, sources of infection, and periods of observation are shown in table 1.

Preputial samples were collected regularly—with but a few exceptions, weekly—by means of a glass pipette which was a modification of the vaginal pipette described by Andrews and Miller.[3] The pipette was made of pyrex glass tubing (8 mm. outside diameter; 1.5 mm. heavy wall). It was 21 in. long and fitted with a 2-oz. rubber bulb at one end, there being a 15-degree bend in the tube 3 in. from the bulb; the other end was shaped so that a blunt chisel edge was formed, the bevel being on the same side as the reflex angle located near the opposite end of the tube. A diagrammatic representation of this device was shown in a previous paper.[4] Before being used, each pipette was sterilized by autoclaving, the free pipette end being kept covered by a paper wrapping until ready for use.

Samples were obtained by inserting a pipette into the prepuce and scraping only the surface of the glans and surrounding preputial membrane with the chisel edge, the bulb being used to aspirate into the pipette the small quantity (usually about 1 cc.) of smegma that could be obtained. Material was drawn only from the areas designated above, as those locations have been proved to be the site of greatest *T. foetus* concentration.[5] As soon as it was withdrawn from the prepuce, the pipette was flushed thoroughly, but gently, with the contents of a previously prepared, sterile test tube containing approximately 7 cc. of 0.7 per cent saline solution.

Samples collected at Beltsville were allowed to stand at room temperature for one to four hours in order to concentrate the organisms, if present, in the sediment.[6] The superficial layer of sediment was then carefully taken up with a capillary pipette, the several drops placed on a glass slide and searched under low power (x100) of a microscope for presence of living *T. foetus*. Samples collected in the field were transported to the laboratory, four to eight hours elapsing, and then usually placed in a refrigerator (45 F.) overnight. The next morning, the samples were held at room temperature for an hour or more and then examined for living *T. foetus* as described above. Usually, it was necessary to search only one slide in order to find the organism; however, before a negative examination was reported, ordinarily two or more slides were prepared and searched.

This work was carried out at the United States Department of Agriculture, Beltsville Research Center, Beltsville, Md.

From the Zoölogical Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture, Beltsville, Md.

Owing to the fact that 6 of the bulls studied, 207, 208 (first and second infections), 214 (second infection), 266, 274, and 275, also served as subjects for unsuccessful experimental treatments with chemotherapeutic agents[7] during the course of these observations, certain results of their examinations have not been included in these analyses. In every instance, where a few negative examinations occurred during, or immediately subsequent to, administration of an unsuccessful treatment, the results of such examinations have been omitted until the reappearance of *T. foetus*. In the case of 207, three unsuccessful treatments were administered and two, three, and one post-treatment, negative examinations have been omitted; in the case of 208, during his first infection, two unsuccessful treatments were administered and five and two post-treatment, negative results have been omitted; in the case of 214, during his second infection, four unsuccessful treatments were administered and five, two, two, and five post-treatment, negative results have been omitted; in the case of 266, two unsuccessful treatments were administered and two and seven post-treatment, negative results have been omitted; in the case of 274, four unsuccessful treatments were administered and two, six, one, and two post-treatment, negative results have been omitted; and in the case of 275, two unsuccessful treatments were administered and eight and eight post-treatment, negative results have been omitted.

Results of examination of nine samples collected from bull 207 by means of another sampling method have also been omitted.

RESULTS

The results of examining 800 preputial samples for *T. foetus* from 10 infected bulls (12 infections) are shown in table 1; 551, or 68.88 per cent, contained trichomonads.

Eight of the bulls, 193, 207, 208, 214, 250, 266, 274, and 275, experienced infections characterized by the presence of *T. foetus* in approximately 45 to 85 per cent of their weekly samples.

Periods of more than two successive negative samples in these bulls were decidedly infrequent. Three, 207, 214 (second infection), and 250, were never found negative more than twice in succession. In 193, however, there occurred one series of three successive negative samples; in 208 (first infection), one series of three negative samples, one series of five negative samples, and (second infection) one series of seven negative samples; in 214 (second infection), one series of three negative samples; in 266, one series of five negative samples; in 274, two series each of three negative samples and one series of four negative samples; and in 275, one series of eight negative samples.

The results of examining the remaining 2 bulls, 218 and 261, differed markedly. In the former, *T. foetus* was found at only eight of 41, or 19.50 per cent, of preputial examinations and in the latter at only four of 47, or 8.51 per cent, of preputial examinations.

In bull 218, extended series of negative examinations occurred between some of the positive examinations. Between the first and second positive examinations there were five negative examinations (an interval of eight months elapsed between the fifth negative and second positive examination, during which time no samples were collected); between the fifth and sixth positive examinations there were ten negative examinations; between the sixth and seventh positive examinations there were nine negative examinations; and between the seventh and eighth positive examinations there were six negative examinations. On the second day subsequent to the eighth positive examination, bull 218 was slaughtered. No *T. foetus* was found on examination of the membrane of the glans and prepuce, urethra, prostate, seminal vesicles, vasa deferentia, epididymides, and testicles. Grossly, all these organs appeared normal.

In bull 261, extended intervals between positive examinations were usual. Seven negative examinations occurred prior to the first positive examination (an interval of four months occurred between the first three and last four negative examinations), four negative weekly examinations between the first and second positive examination, six negative weekly examinations between the second and third positive examination, and 26 negative weekly examinations between the third and last positive examinations. Since the infection of bull 261 was unusual and study of his history makes clear the problems created by such a case, his history is presented in detail in the following protocol:

Protocol of Bull 261.—Bull 261, a pure-bred Holstein-Friesian born April 17, 1942, was used in a trichomonad-infected dairy herd during the summer of 1943. It is certain that he became infected during this period as later investigation revealed that *T. foetus* had been found in a female following coitus with this bull; unfortunately,

TABLE I—Occurrence of Trichomonas Foetus in Preputial Samples from Infected Bulls

Animal No., breed, date of birth	INFECTION			SAMPLES			
	No.	Mode of transmission	Source of trichomonads	Period of sampling	No. examined	No. containing *T. foetus*	Ratio and % containing *T. foetus*
193—Mixed Guernsey 4/30/39	1st	Experimental[1]	From 207 through ♀ 224	4/22/42-7/14/43 at Beltsville	66	52	52:66 = 78.80%
207—Mixed Guernsey 5/19/40	1st	Experimental[1]	From herd A through ♀ 1298	12/3/41-3/21/46 at Beltsville	199	168	168:199 = 84.92%
208—Purebred Guernsey 10/29/34	1st	Natural	From herd B	2/6/41-7/2/43 at Beltsville	116	93	93:116 = 80.17%
	2nd[2]	Experimental[1]	Direct from 274	10/9/44-3/21/46 at Beltsville	68	54	54:68 = 79.26%
214—Mixed Jersey 12/3/40	1st	Experimental[1]	From 207 through ♀ 224	1/1/43-5/22/43 at Beltsville	16	10	10:16 = 62.50%
	2nd[3]	Experimental[1]	From 193 through ♀ 181	7/13/44-12/5/45 at Beltsville	57	49	49:57 = 85.96%
250—Purebred Holstein-Friesian 8/30/40	1st	Experimental[1]	From 207 through ♀ 232	9/15/43-2/26/44 at Beltsville	22	11	11:22 = 50.00%
250—Purebred Holstein-Friesian 8/?/40	1st	Natural	From herd C	9/11/43-6/8/44 at farm C	23	10	10:23 = 43.48%
				6/26/44-7/6/44 at Beltsville	3	1	1:3 = 33.33%
274—Purebred Aberdeen Angus 3/22/37	1st	Natural	From herd D	11/11/43-4/19/45 at farm D	47	28	28:47 = 59.95%
				5/4/45-3/21/46 at Beltsville	44	32	32:44 = 72.72%
275—Purebred Aberdeen Angus 1/25/42	1st	Natural	From herd D	11/11/43-4/19/45 at farm D	39	27	27:39 = 69.23%
				5/4/45-3/21/46 at Beltsville	12	4	4:12 = 33.33%[4]
218—Mixed Guernsey 8/16/41	1st[5]	Experimental[1]	From 207 through ♀ 232	9/29/43-1/31/45[5] at Beltsville	41	8	8:41 = 19.50%
261—Purebred Holstein-Friesian 4/17/42	1st	Natural	From herd C	9/11/43-3/2/44 at farm C	8	1	1:8 = 12.50%
				3/27/44-11/27/44[2] at Beltsville	39	3	3:39 = 7.69%
Above infections except 218 and 261.....Total					712	539	539:712 = 75.70%
All infections.....Total					800	551	551:800 = 68.88%

[1]Technique previously described.[4]

[2]11/27/44 is considered as end of infection. Subsequently, *T. foetus* was not found in 74 samples examined up to 3/19/46.

[3]First infection terminated by treatment. Intentionally reinfected.

[4]During this period the majority of samples collected contained much foreign material.

[5]Reinoculated on 9/23/44 (between the fifth and sixth positive examinations). It is possible that a second infection was thus initiated, but it seems more probable that no interruption occurred in the first infection.

this fact was not known until January, 1944. He served no infected females subsequent to August, 1943.

On Sept. 11, 23, and 29, 1943, preputial samples were collected and examined; no *T. foetus* was found. Four virgin heifers with which this bull had coitus during the late summer or fall of 1943 were examined at appropriate times; no *T. foetus* was found.

On Jan. 28, 1944, *T. foetus* was found in a female served by this bull on Nov. 27, 1943; on Feb. 14, 1944, *T. foetus* was found in another female served by this bull on Jan. 24, 1944.

Weekly examinations of preputial samples were resumed on Feb. 2, 1944, and continued to March 19, 1946, the day of slaughter; a total of 121 samples were examined. *T. foetus* was present on only four occasions: Feb. 22, April 29, June 17, and Nov. 27, 1944. Forty-seven preputial samples were examined between Sept. 11, 1943, when the bull was first sampled, and Nov. 27, 1944, when *T. foetus* was last demonstrable. Seventy-four preputial samples were examined thereafter. In addition, on April 15, May 16, and June 20, 1944, seminal fluid was obtained by massage *per rectum* of the internal genitalia; no *T. foetus* was found in the material obtained.

To help determine if this bull had recovered spontaneously from infection, he was allowed to serve 2 susceptible females. On June 6, 1945, he served previously uninfected cow 257; on Dec. 1, 1945, she aborted twin fetuses, 1 male and 1 freemartin. Bacteriologic examination of major visceral organs revealed them to be sterile*; examinations for *T. foetus* were negative. On Jan. 28, 1946, this bull again served the same female; she is, to date, pregnant. Examination of vaginal samples five days each week since first exposure has at no time revealed trichomonads. On Oct. 17, 1945, bull 261 served previously uninfected cow 198; she is, to date, pregnant. Examination of vaginal samples five days each week since first exposure has at no time revealed trichomonads.

On March 19, 1946, bull 261 was slaughtered. Examination of the membrane of the glans and prepuce, urethra, prostate, seminal vesicles, vasa deferentia, epididymides, and testicles revealed no *T. foetus* or, grossly, indications of disease.

*The helpful coöperation of Dr. Chester A. Manthei, Pathological Division, BAI, in carrying out these bacteriologic examinations is gratefully acknowledged.

DISCUSSION

From the preceding observations, it is possible to derive some indication of the variations in population of *T. foetus*, detectable by the essentially qualitative technique employed, that occur in the preputial cavity during infection.

In the cases of 8 bulls, although the majority of their samples contained *T. foetus*, the number of negative samples was considerable. Some conjecture as to the causes of these findings seems in order.

A few of the obvious extrinsic factors noted during these observations that can (*a*) deplete the trichomonad population below the level where organisms are usually found in preputial samples, or (*b*) create conditions rendering collection of satisfactory samples impossible, either one limiting the efficacy of the technique employed as a precise diagnostic procedure, are as follows:

1) *Coitus.*—*T. foetus* is not usually found in preputial samples for several days subsequent to coitus, probably because of mechanical removal of many organisms from the genital membranes.

2) *Chemical Agents.*—As previously pointed out, some of the bulls studied in these experiments had chemical agents introduced into the prepuce; short periods of inability to demonstrate *T. foetus* were usual subsequent to such unsuccessful treatments. In so far as possible, consideration of such artificially produced negative phases has been removed from these data.

3) *Contamination of the Preputial Cavity.*—Masturbation, a common practice of bulls of all breeds, often results in gross contamination of the preputial cavity. Intermittent prolapse of the preputial membrane, an anomaly of the Aberdeen Angus, also frequently results in gross contamination of the preputial membrane of bulls of that breed. Such contamination not only precludes collection of samples satisfacto for effective search for *T. foetus*, but, since short negative phases follow such occurrences, probably temporarily depresses the trichomonad population.

The intrinsic factors which may account for depression of the parasite population —variations in the physiology of the penile

and preputial membrane, effects of changing pH and bacterial flora, development of resistance, etc.—being more subtle in nature, are not so readily evaluated. However, *T. foetus* did fail to appear occasionally in preputial samples for indefinite periods without obvious cause; such intrinsic factors as suggested probably entered the picture. The mechanics of the sampling and examining technique *per se* probably accounted for a small, unavoidable, but still appreciable, experimental error.

In producing the unusual course of infection which occurred in bull 261, the above first mentioned extrinsic factors played no part as this bull served no females between January, 1944, and June, 1945, nor was he at any time subjected to experimental treatment for trichomoniasis or at any time found to have a grossly contaminated preputial cavity. Sampling and examination techniques were the same as for the other bulls. There was no evidence of existence of internal foci which could have maintained extrapreputial infection and thus accounted for the occasional occurrence of organisms in the samples: trichomonads were not found on examination of his seminal fluid or, at postmortem examination, in any of his normal appearing internal genitalia.

Only in the characteristic that he seemed somewhat more difficult to sample—the membrane being very dry—did this bull differ objectively from the others studied. However, it is significant, and the underlying causes are probably related, that 261 evidently recovered spontaneously from infection.

Bull 218 served no females during his life nor was he ever subjected to experimental treatment; badly contaminated samples occurred infrequently.

Andrews and Miller,[8] Alson,[9] Avery and Garlick,[10] and Morgan[11] have previously recorded that, in their respective series of preputial examinations of infected bulls, they were unable at times to demonstrate *T. foetus*. The examination procedure of Andrews and Miller consisted in part of flushing the preputial cavity with about 25 cc. of sterile saline containing 0.5 cc. of defibrinated blood, "milking" the sheath with the hand, immediately examining microscopically a portion of the material obtained, and later examining the remainder after incubation on whole egg slants. When these methods were employed on 45 occasions in 7 infected bulls, *T. foetus* was found four times in 1 bull and once in another; the remaining 5 bulls were not found infected by these methods. Examination of 5 additional infected bulls by the same methods on an unstated number of occasions failed to reveal *T. foetus*. In order to secure preputial samples, Alson used a piece of cotton attached to a wire; he found *T. foetus* on direct examination at four of six examinations of 1 bull. Avery and Garlick used the vaginal pipette described by Andrews and Miller,[3] and examined directly fluid left in the pipette after most of the material obtained had been ejected into culture tubes; they found *T. foetus* at six of eight examinations in 1 bull. Morgan used a piece of cotton attached to a light metal rod with which he swabbed the preputial cavity, afterwards placing the cotton in culture mediums. His results of examining 5 bulls, presumably infected at the beginning of the period of observation, were as follows: bull 1—*T. foetus* was not found at any of five examinations made over a period of two months; *T. foetus* was found at slaughter only. Bull 2—*T. foetus* was found only on the fifteenth and eighteenth of a series of 19 examinations made over a period of four months. Bull 3—*T. foetus* was found only on the first, second, fifth, ninth, twelfth, and fourteenth of a series of 14 examinations made over a period of eight months. Bull 4—*T. foetus* was found only at the eighth of a series of 12 examinations made over a period of eight months; *T. foetus* was found at slaughter. Bull 5—*T. foetus* was not found at any of 11 examinations made over a period of four months; *T. foetus* was found at slaughter. The preceding results of Andrews and Miller and of Morgan (in which only five of more than 45, and only nine of 61, respectively, examinations of preputial samples from infected bulls revealed *T. foetus*) involve sufficient numbers to be significant. These results indicate either that (1) their respective series of bulls all experienced infections essentially like that of bull 261 cited in this paper, or (2) their techniques for preputial examinations were unsatisfactory. The latter seems more probable.

Swangard[12] suggested a technique for collecting preputial samples in which a specially constructed, metal, capped, tubular device containing a brush was utilized. By the use of this device, kindly

loaned by Dr. Swangard, nine samples were collected at intervals from bull 207, the brush rinsed with 0.7 per cent saline, and the material obtained allowed to sediment; two samples contained *T. foetus*. In these limited observations, the efficacy of this device did not compare favorably with the glass pipette described herein.

Although the use of several varieties of culture mediums has been recommended in diagnosis of trichomonad infection in bulls, no experimental data have as yet been presented to prove that through the use of any mediums the chance of finding *T. foetus* is materially improved. The results obtained by Andrews and Miller, in which only five of 45 preputial samples from 7 infected bulls and an unrecorded number of preputial samples from 5 other infected bulls were found to contain *T. foetus*, involved the use of a slant of medium containing whole egg, saline, and defibrinated rabbit blood. According to the data presented by Avery and Garlick, neither Ringer's egg-blood medium nor saline-egg medium enhanced their ability to demonstrate organisms in eight preputial samples known to contain *T. foetus*. The results obtained by Morgan, in which only nine of 61 samples from 5 infected bulls were found to contain *T. foetus*, presumably involved the use of his all liquid mediums. The explanation for failure of culture mediums seems apparent. Many varieties of bacteria are introduced into the mediums with the exudate obtained from the prepuce. These bacteria, being capable of growth more rapid than trichomonads, quickly render the environment unsuitable for development of *T. foetus;* this is further intensified when the medium is incubated at 37 C. The concentrating effects of sedimentation alone have been shown to improve materially the chance of finding *T. foetus*.[6]

APPLICATION IN DIAGNOSIS

Based upon previous researches and the preceding discourse, the following procedures and examination techniques for determining the status of individual bulls are recommended. Reasons for each step follow:

1) Study the reproductive history of the herd. Suspicion of infection in the herd should intensify suspicion of infection in the individual.

2) Study the reproductive history of the bull. Low rate of conception, particularly in heifers, may be suggestive of infection. High rate of conception, particularly in heifers, may be suggestive of freedom from infection.

3) Study the reproductive histories of those females served by the bull. Infection in the bull will result inevitably in infection of some females with which he has coitus. Necessity for repeated services, early termination of pregnancy as evidenced by unexpected return to estrum more than three weeks after coitus, early abortion, and/or pyometra occurring in several females may be suggestive of infection in the bull.

4) Examine for *T. foetus* heifers that have been served only by the bull. Demonstration of *T. foetus* in the properly selected female is simpler and more certain than in the bull since the numbers of *T. foetus* that occur at specific times in vaginal samples may number in millions per cubic centimeter, while in preputial samples the numbers are always relatively few. Selection of females and collection of vaginal samples have been described fully in a previous paper.[2]

5) Examine the bull.—(*a*) Palpate, *per rectum*, the accessible internal genitalia. Rarely, bulls may become infected internally with *T. foetus*. Recognition of any abnormality should create suspicion of internal foci.

(*b*) Collect samples for examination for *T. foetus* from the surface of the glans and surrounding prepuce only. These designated areas have been proved to be the site of greatest concentration of trichomonads.

(*c*) Use the glass pipette described herein for collection of samples. This pipette allows a precise selection of the areas to be sampled; all smegma obtained may be recovered for examination. The pipette is easily sterilized, inexpensive, and made of readily available materials. Although glass pipettes may break during use, such an occurrence is rare and is no reason for concern. Without aid or interference, the broken pieces will be passed from the prepuce in a relatively short time.

(*d*) Use 0.85 per cent saline solution for flushing the pipette. An osmotic tension acceptable to *T. foetus* is produced by 0.85 per cent saline. Use of culture mediums has not been shown, as yet, to improve the chance of finding *T. foetus*, by increasing

their numbers, when present. Prevent evaporation of the sample; trichomonads cannot tolerate drying.

(*e*) Allow the mixture of smegma and saline to sediment for an hour before examination. Then, if present, *T. foetus* is concentrated in the superficial layer of sediment. If immediate examination is not possible the sample may be refrigerated, in order to control the growth of bacteria, at 45 F. up to eighteen hours. Although this treatment materially reduces the number of *T. foetus* it is preferable to adding preservatives; sufficient trichomonads, when present, to make a positive diagnosis possible usually survive refrigeration. *T. foetus* occurs in relatively small numbers in preputial samples; when killed by preservatives they are very difficult to recognize.

(*f*) Search a thick smear for living *T. foetus* under low power of a microscope, obtaining the material from the superficial layer of sediment by means of a capillary pipette. If *T. foetus* has been obtained from the bull, it may usually be found in this manner.

(*g*) Repeat preputial examinations of the bull at weekly intervals for at least six weeks before judging failure to find *T. foetus* significant. Thereafter, if the bull's clinical history is suspicious of trichomoniasis, intentionally test-breed susceptible (virgin) heifers. Watch all females with which he subsequently has coitus. As shown in this paper, *T. foetus* is not found in all preputial samples collected from infected bulls; in exceptional infected bulls, relatively long series of negative examinations may occur. However, even if *T. foetus* is not detected by preputial sampling, if present, they will eventually be revealed in susceptible females with which the bull has coitus.

SUMMARY

1) *Trichomonas foetus* was found in 551, or 68.88 per cent of 800 preputial samples from 10 infected bulls (12 infections).

2) Infections in 8 of the bulls (10 infections) were characterized by frequent, 45 to 85 per cent, occurrence of *T. foetus* in the preputial samples. These infections were considered typical.

3) Infection in the 2 remaining bulls was characterized by infrequent occurrence of *T. foetus* in the preputial samples, eight of 41 samples (19.50%) being positive in 1 case and 4 of 47 (8.51%) in the other. These infections were considered atypical.

4) Application of the experimental observations to the practical problem of diagnosis of bovine venereal trichomoniasis is made. A detailed procedure for examining bulls for *T. foetus* is presented.

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Is Streptomycin Overrated?

Evidence indicates that streptomycin has been over-touted. While theoretically specific in typhoid and brucellosis, its clinical use in these diseases has been discouraging. It has value in the treatment of tularemia and in certain Pfeiffer bacilli and urinary infections. Its use in tuberculosis and all other diseases is in the trial stage.—*From Information Please Symposium, J.Am.M.A., Dec. 21, 1945.*

Perhaps, livestock medicine and owners are fortunate in having to wait until the makers of streptomycin catch up with the demand.

NUTRITION

Research Developments in Dog Nutrition

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IT HAS BEEN authoritatively stated[1] that nutrition is the most fertile field in the world of medical research today. The dog has long been used in nutritional research. Some of the first studies on protein quality were done with this animal. The fact that the species used in experimental studies is frequently benefited to a great extent by the experiment is notably exemplified in the discovery that niacin was shown to be effective in treating black-tongue in dogs, prior to its demonstrated effectiveness against pellagra in human beings.

PROTEINS

Although the importance of calories, carbohydrate, fat, and protein in the nutrition of the dog cannot be underestimated, the numerous reports of research on these factors have been adequately presented in a recent review.[2] In view of the increasing interest in amino acids in nutrition, it is pertinent to note that the protein intake of the dog can be replaced by the ten essential amino acids (*i.e.*, threonine, valine, leucine, isolucine, tryptophane, lysine, phenylalamine, methionine, histidine, and arginine) without impairing weight, nitrogen balance, or plasma protein production of the animal.[3] These findings indicate that mixtures of essential amino acids should provide a valuable addition to transfusion and infusion therapy in conditions associated with deficient nitrogen intake or tissue injury and accelerated nitrogen loss, including shock, burns, and major operative procedures. Howe, *et al.*[4] report that mixtures of natural amino acids can be given to dogs intravenously at much higher rates without inducing vomiting than can similar mixtures containing racemic amino acids. Of the single racemic amino acids tested, dl methionine was the most poorly tolerated. Glycine caused a definite increase in the tolerance of the dogs to infusion of certain mixtures of racemic amino acids.

Although meat and other animal products are probably the most widely used protein sources for dogs, it has been shown that a diet composed entirely of vegetable components is satisfactory for the growth of pups.[5]

One of the most perplexing problems in dog nutrition is that of running fits, or hysteria disease. It is well known that dog foods of high cereal content, particularly wheat, when baked at a high temperature for relatively long periods tend to induce this disease regularly. The most common treatment, in practice, is to change to a diet containing more animal protein and less cereal. The claims that it can be prevented or cured by vitamin B_1[6], or that it may be due to a deficiency of the amino acid, lysine,[7] have not been substantiated.[8,9] Morgan[8] has shown that high levels of quality protein such as casein were effective in preventing the disease. Wagner,[9] in an extensive study, could not attribute a significant preventive or curative rôle to casein. Canine hysteria of the nutritional type can be produced by experimental rations containing wheat gluten flour,[9, 10] and the disease appears to be caused by some toxic factor present in wheat products. The exact nature of this toxic material awaits further experimentation for its elucidation.

VITAMIN B COMPLEX

Studies on the dog's requirements for the vitamin B complex have been carried out most satisfactorily using a synthetic ration composed of sucrose, casein, cottonseed oil, and mineral salts, supplemented with vitamins A and D. It has been established that dogs grow well and maintain a good state of health without receiving any B vitamins other than niacin, thiamin, riboflavin, pyridoxine, pantothenic acid, and choline.[11] An even more rigorous test of the efficacy of this simple dietary regimen is the fact that hemoglobin is adequately and rapidly regenerated on such a ration, even in the face of repeated and severe phlebotomy.[12] This rather simple requirement for B vitamins has been shown to be adequate even when succinylsulfathiazole, an insoluble sulfonamide, was incorporated in the ration at levels up to 4 per cent. It is evident that the bacterial flora in the intestine of the dog is relatively resistant to modification as manifested by the lack of a deficiency for any other B-complex member. No differences could be observed between the animals receiving the drug and the

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controls. Hemoglobin per 100 Gm. of blood, total hemoglobin, red blood cells, mean cell volume, food consumption, growth increase, and general state of health were taken into consideration.[13]

Numerous studies have been made on the results of thiamin, riboflavin, pantothenic acid, niacin, pyridoxine, and choline deficiencies in the dog. In a study on the relation of thiamin to blood regeneration,[14] it was concluded that sufficient thiamin for the maintenance of weight in an adult dog, or for adequate growth in a young dog, is sufficient, also, for the maintenance of a normal blood stream even under adverse conditions.

Riboflavin has, however, been shown to play a rôle in blood regeneration.[15] Phlebotomy in the absence of riboflavin results in a microcytic, hypochromic anemia while, in the presence of riboflavin, the anemia produced by phlebotomy is of the normocytic, hypochromic type. It has been suggested, therefore, that riboflavin[15] plays a rôle in the formation of red blood cells. On severely riboflavin-deficient diets, dogs collapse rather suddenly.[16] This collapse is characterized by a fall in respiration rate and by a variable heart beat. Prolonged riboflavin deficiency leads to the development of neurologic abnormalities with myelin degeneration of peripheral nerves.[17] Pantothenic acid deficiency may also play a rôle in this nerve degeneration.

Diets deficient in pantothenic acid cause rapid cardiac and respiratory rates, convulsions, and frequently gastritis or enteritis and intussusception; such diets also lead to sudden collapse and death in dogs.[18]

The dog's requirement for choline has been shown to be not more than 50 mg. per kilogram of body weight per day for the growing pup.[19] The level of choline required depends to some extent on the level of fat in the diet. The reports by Lambooy and Nasset[20] and by Smith[21] that dogs require B-complex factors other than the six indicated above have been criticized[12] because diets high in fat and low in choline were used. This criticism seems justified in view of the fact that when adequate levels of choline were used in similar high fat rations,[12] no deficiency symptoms such as had been described previously[20, 21] could be demonstrated.

A microcytic, hypochromic anemia is evident in vitamin-B_6-deficient dogs,[25] since these animals excreted kynurenin and xanthurenic acid but no kynurenic acid after the ingestion of single doses of 2 Gm. of dl tryptophane. Similarly treated animals that had received pyridoxine excreted kynurenin and kynurenic acid, but no xanthurenic acid. Only tryptophane induced this abnormal metabolism in dogs.

Evidence is now available[26] that folic acid (synthetic *L. casei* factor) is required by the dog under certain conditions. When young, growing dogs are placed on a niacin-low, synthetic ration and allowed to proceed to a severe niacin deficiency, they frequently fail to respond to standard doses of niacin. Those that do respond quickly fail again and death generally ensues, despite further administration of niacin. When the basal ration is supplemented with folic acid and the same experimental conditions followed, the dogs respond adequately and consistently to niacin therapy. Folic acid is now added to the vitamin supplement in all niacin deficiency studies with dogs.

Another syndrome associated with niacin deficiency is the sulfapyridine-induced inhibition of the usual curative effect of niacin in blacktongue dogs.[27] This inhibition, which is overcome by fresh liver, can also be induced with sulfathiazole and, in addition to liver, it has been shown that milk is active in overcoming the effect of sulfathiazole.[28] Since folic acid complicates the picture of the usual niacin deficiency it may be that large levels of folic acid are effective in this syndrome.

The importance of imbalance in nutrition and its effect on requirements is becoming increasingly evident. A prime example of imbalance in a diet and its effect on the dietary requirement for a vitamin is evident in the observation that a niacin-low diet, composed of 40 per cent corn, can induce growth failure in rats which can be corrected by the addition of niacin to the diet.[28] It has been further observed that the amino acid, tryptophane, as well as niacin, is effective in counteracting this growth depression.[28] These observations have been extended in studies with the dog in which case its requirement for niacin is increased about threefold when large amounts of corn are included in the ration.[29]

Although dogs can be raised on a relatively simple diet with only six of the B vitamins, the possibility of other deficiencies exists under certain specialized conditions. When, for example, the casein used in the synthetic ration is exhaustively extracted with ethanol (95%), a deficiency characterized by a failure to de-

TABLE I—Suggested Vitamin Allowance for the Dog

Vitamin	Per kg. body weight	Per 100 Gm. dry ration	Per lb. dry ration	Per lb. canned dog food (70% moisture)
A	70 IU	210 IU	950 IU	300 IU
D	10—20 IU	30—60 IU	135—270 IU	40—80 IU
Thiamin	25—50 μg.	75—150 μg.	560 μg.	150 μg.
Riboflavin	40—80 μg.	120—240 μg.	800 μg.	240 μg.
Niacin	0.2—0.4 mg.	1.0 mg.	4.5 mg.	1.5—2.0 mg.
Pyridoxine (v. B_6)	20—30 μg.	90 μg.	400 μg.	120 μg.
Pantothenic acid	0.1 mg.	0.3 mg.	1.4 mg.	0.45 mg.
Choline	30—50 mg.	100 mg.	450 mg.	135 mg.

velop a normal level of hemoglobin and a rather severe achromotrichia develop slowly. In addition, the growth rate is diminished. Evidence has been presented that biotin may be important in correcting the hemoglobin deficiency, but no known vitamin has prevented the achromotrichia.[19]

A paralysis which is first spastic, and later almost flaccid, has been produced on a synthetic ration.[20] This paralysis is prevented by brewers' yeast and is reported to have been cured with biotin. The apparent biotin deficiency is complicated, however, by a concomitant potassium deficiency in the diet employed, and evidence now at hand[21] shows clearly that the paralysis can be completely and dramatically cured with potassium. The possible rôle of biotin in the nutrition of the dog still remains obscure, although it is now added as a precautionary measure to the usual B vitamins listed above.

The dog's requirement for the fat soluble vitamins should not be overlooked since deficiencies of some of these vitamins occupy a prominent place in practical dog nutrition.

VITAMINS K AND E

The dog's requirement for vitamin K is adequately satisfied by the mechanism of intestinal synthesis. Although vitamin E is the principal factor concerned in the lack of proper development in pups born of dogs fed mineralized, evaporated milk diets,[22] further investigation is necessary before definite conclusions can be reached regarding this vitamin in the dog's diet.

VITAMIN D

Considerable disagreement exists over the exact vitamin-D requirement of the dog. Factors such as sex, breed, Ca : P ratio and, perhaps, the acid-base balance in the ration are important determinants in establishing its requirement. With a normal Ca : P ratio of approximately 1.2 : 1, a daily dose of 10 to 20 I.U. of vitamin D per kilogram of body weight is adequate.

VITAMIN A

Various complicating factors such as breed and storage in the liver render it difficult to place a definite value on the vitamin-A requirement. One interesting and confusing symptom of vitamin-A deficiency is the same characteristic mouth lesion of blacktongue, a symptom also of niacin deficiency. It is generally concluded that 20γ of vitamin A per kilogram of body weight is a generous intake even for a growing dog. This would be equivalent to 40γ to 60γ of carotene which is well utilized by dogs.

The approximate dietary requirements of the dog for the various vitamins discussed herein are presented in table 1. It must be borne in mind that these figures, while approximate, are adequate under normal conditions even for the growing dog.

MINERALS

The dog's requirements for minerals and their importance in dog nutrition should not be overlooked. Of the common minerals, the dog definitely needs calcium, phosphorus, sodium, chlorine, potassium, magnesium, iron, copper, iodine, and probably manganese, cobalt, and zinc. Not much is known about the respective quantitative requirements of these minerals, but the work that has been done on calcium and phosphorus indicates that the absolute levels of these minerals may not be so important as the ratio between the two elements. The ratio of 1.2 : 1 seems to be the most favorable when both elements are present in completely assimilable form.[23] Large excesses of calcium increase the need for vitamin D to the point where it is practically impossible to prevent rickets.

CONCLUSION

One must not be misled by the seemingly simple vitamin requirements of the dog. It must be remembered that they were established with carefully controlled and well-balanced synthetic rations. Practical feeding conditions with natural foodstuffs may impose situations. such as the imbalance created with corn in niacin-low diets, which may markedly alter the vitamin requirements.

Much fundamental research remains to be done, not only in discovering and characterizing new nutritional factors, but in studying and clarifying the biological function of the existing well-known vitamins.

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Factor X

An unidentified food factor, as yet known only as nutrient factor X, has been recognized by Hartman and Cary of the United States Department of Agriculture. It plays an important part in the palatability of food and feed, but goes deeper than merely taste—it also involves the needs of the body for food and the use to which the body can put the food eaten.

Work with this factor began more than four years ago, and many things have been learned about it, if not the actual composition. Factor X is present in milk and milk products, in lettuce, egg yolk, beef muscle, pork muscle, and in blue grass, alfalfa, and timothy hays. Its precise function in the body is not known, but it appears to permit more effective utilization of the protein fraction of the diet—and this is true whether it be eaten with the food or injected into the tissues in the form of liver extract, in which it is present in high concentration. Factor X is also known to be *not* present in whole wheat flour, white flour, enriched white flour, corn meal, soybean meal, linseed meal, heat-coagulated egg white, or in yeast.

Commercial drying of milk and casein does not destroy this nutrient factor, but coagulation of egg white does. It resembles a vitamin but is distinct from any of the known vitamins.

It will be noted that the normal source of factor X in the human dietary is in the foods of animal origin, again emphasizing the need for food of this type and the danger of going back to a cereal diet.

In the suckling and post-weaning stages of baby beef calves, those fed maize without molasses gained weight more rapidly, were in better condition, and required less concentrates per 100-lb. gain than those receiving maize and molasses.—*USDA Tech. Bull. 862.*

A ration balanced on paper may not prevent malnutrition, because the analyses used in tables are approximate and because the owner tends to classify his homegrown feeds at the maximum allowances rather than to downgrade because of poor soil, unfavorable growing conditions, bad curing weather, or inadequate storage conditions.

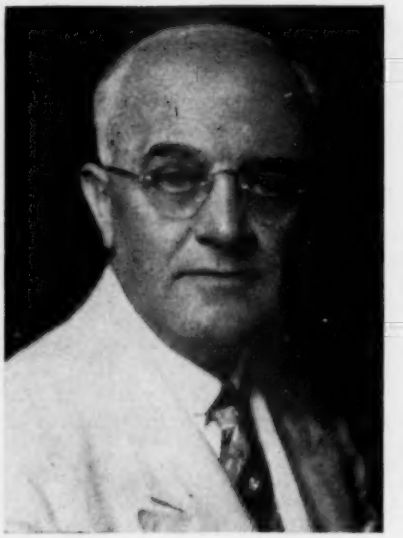
EDITORIAL

Harry W. Jakeman
1885-1946

For a more comprehensive obituary of Harry Jakeman than space permits here, the biographer is referred to pages 189-190 of the January, 1941, issue of the JOURNAL where more salient details will be found about the life of our lamented colleague — a past-president (1941-1942) of the AVMA and longtime architect of, and worker in, the veterinary profession of North America, who passed from this life at his home near Boston on Dec. 23, 1946, after an illness that had removed him from his more arduous private and professional activities for the past two years. Mere words will not express the depths of sorrow that overtake a whole profession at the sudden departure of so faithful a friend and so tireless a worker in its behalf. To his biography (*loc. cit.*) praise can now be added that could not have been told with propriety in 1941.

Now it can be truly said that the deceased, allegorically speaking, was one of the three musketeers—Bergman, Brumley, Jakeman—who set the AVMA "on the beam" for the long-postponed reformation in its affairs, the reformation that was to triple its membership, multiply its influence, expand and improve its literature, augment its public relations, and insure its participation more coöperatively in state, federal, and commercial agencies, upon which the force of the veterinary profession depends.

The revolutionary changes which had overtaken veterinary-medical science and its effective application, particularly in the 1930's, were taken in hand and set unobtrusively in order. The results may now be weighed and credited to the straight thinking and do-or-die action of the "three musketeers" whom the veterinary historian of the more distant future will not be likely to overlook. History can separate deeds and doers. Thoughtful biographers perpetuate the liaison and venerate both. While the heart center of the AVMA may seem to panegyrize the life of Dr. Jakeman most for his masterful work in behalf



Dr. Harry W. Jakeman

of nation-wide organization, his name will not be soon forgotten in New England where eighteen years ago he founded the New England Veterinary Medical Association and served the Massachusetts association for the seventeen years preceding his demise. There, as well as on the pages of veterinary history, his name is indelibly written.

Dr. Jakeman was born in Nova Scotia, son of William Jakeman (MCG '79), and was graduated by the School of Veterinary Medicine, University of Pennsylvania, in 1909. He is survived by his widow and inseparable aide, *née* Anna Carter, whom he married in 1909; a son, William C., offi-

cer in the Naval Air Service; and a daughter, Betty, prominent in the insurance circles of Boston. The late Walter Jakeman (HARV '96) was his brother. May his shadow never be less. We are proud to have known him well and never to have found him wanting.

Walter K. York — 1891-1946

By the death of Walter K. York (KCVC '12), the commercial field loses an outstanding figure and tireless worker, hail, hearty, and well met, who leaves a rich legacy to the boys of the service of supply and their employers. The producers of current necessities, whose program is dispersion into the hands of competent users directly from the laboratory, are indebted to figures like Walter York who endeared himself to the profession by an honest effort to maintain a close liaison between the smallest needs of the field and the obligations of the laboratories without fault of product or delivery—a welcome characteristic in this period of veterinary-medical development.

In recent years, Dr. York was an active exponent of local, state, and national associations, and a faithful representative of the Fort Dodge Serum Company at Indianapolis. His connection with the AVMA (1920-1946) was of the on-again-off-again pattern, followed by many without risk of losing caste during the years of sketchy evolution and unseen achievements of the AVMA.

Dr. York, who was born a Cornhusker at Loomis, Neb., on April 7, 1891, passed away at his home in Monticello, Ind., on Dec. 22, 1946, and is survived by his widow, *née* Amelia Hauberg, to whom he was married Jan. 28, 1914.

General Jean Fray — 1860-1945

Gen. Jean Fray, 85, honorary member of the AVMA, past-president of the French veterinary academy, alumnus of Lyon, and chief veterinarian of the French Army during World War I, died in Paris Jan. 23, 1945, at a time when news from France was interrupted by the war. He was born of a distinguished veterinary family at Amberieux-Dombes, April 30, 1860, and after his graduation served in the military formations of the Army in North Africa where he brought order into the colonial veterinary service. He returned to France at the beginning of the great war to distinguish himself for organizing his country's first centrally commanded corps of military veterinarians.

At the outbreak of hostilities in 1914, the army veterinarians of France, like those of the U.S.A. and Great Britain, were caught too poorly and unwisely organized to avert the climactic catastrophes that overtook the military animals of France, Belgium, and Britain during the first year of the historic invasions by the German legions. It remained for General Fray in France and General Moore in Britain to whip veterinary military service into working order; to accomplish this they fought against the obstacles of archaic tradition which had left veterinary medicine loosely attached to the cavalry arm without central direction.

Although two years late, we pause to pay this homage to an honorary member who cannot be denied the honor of founding the type of military veterinary service that developed from his difficult task. General Fray was a man to love for his amiable character, his broad erudition, his scientific ideals, his disciplinary knack, and the high respect he commanded in all ranks of his entourage.

Two unforgettable things are recalled from conversations with the General in the line of duty: (1) His incidental remark that veterinary officers, because of the nature of their service, must be better groomed, more decorous, and more proficient in the performance of their duty than officers of the arms; and (2) skillful veterinary service is a powerful agency in the colonization of backward people—a reflection born of long experience in southern Tunisia.

Sadly, we remove the name of General Jean Fray from the list of living honorary members. He was a profound scholar, a great veterinarian and commander—a great man.

Mg. per cent.—The term "mg. per cent," used without indicating per cent of what, has no place in scientific literature and henceforth will not be used in the JOURNAL. It is confusing, incomplete, and pedantic, particularly the latter.

Outbreak of Foot-and-Mouth Disease in Mexico

Recent releases of the USDA announce that in late December foot-and-mouth disease was discovered in the Mexican states of Vera Cruz and Pueblo, and in the vicinity of Mexico City. The diagnosis was confirmed by both Mexican and United States government veterinarians—consequently inspectors at the Mexican border were instructed to inspect no more ruminants or swine. This, in effect, excludes from entry into the United States cattle, sheep, goats, and swine.

This temporary action was to be followed by a formal order prohibiting importation from Mexico of ruminants or swine, or fresh meats of such animals. As is well known by veterinarians, such action is necessary to protect the production of meat and milk in this country.

It will be remembered that North America, including Mexico and Central America, has been kept free from foot-and-mouth disease by maintaining rigid quarantine against livestock from South America, where interest in its eradication falls below acceptable standards.

The present outbreak, which Mexico treats as a great misfortune justifying vigorous measures, appeared about November 1 as a result of two shipments into Mexico of Zebu bulls from Brazil, late in 1945 and the spring of 1946. The United States, under the terms of the Mexico-U.S. Sanitary Treaty, reminded Mexico of the dangers involved in such importations, and when the second shipment was permitted the movement of Mexican cattle into the United States was halted. However, extensive investigations by United States and Mexican veterinarians failed to reveal the presence of foot-and-mouth disease, and the border quarantine was lifted Oct. 18, 1946.

Since the infection in the present outbreak remains confined to the original center in, and adjacent to, the state of Vera Cruz and Mexican and U. S. Veterinarians are coöperating in carrying out a comprehensive campaign of extermination, there is less danger of it spreading to this country. To eradicate foot-and-mouth disease, the determination to do so must exist and that is not lacking in the two countries.

The outbreak of 1929, brought in with ships' garbage from Buenos Aires, was quickly stamped out because it was detected early through the vigilance of California veterinarians.

From Mexico City comes the information that Secretary of Agriculture Nazario Ortiz Garza and his under-secretary, the director of animal industry, and his leading veterinarians, met in December with President of the Republic Aleman to plan an active campaign against the disease. They pronounced the outbreak "a great national disgrace" and the Mexican press denounced former Secretary of Agriculture Marte R. Gomez for having permitted the importation of Zebus from a quarantined country—Brazil.

Yet, despite the magnitude of the foot-and-mouth disease plague in livestock countries like Mexico and the United States, its potential arouses but little attention beween outbreaks and, even during the peak of outbreaks, there is no lack of opponents to the vigorous measures that have to be taken to stamp it out. An outbreak occurred among the entries of the National Dairy Show just prior to World War I, and echoes can still be heard (without an ear trumpet) of the big rumpus the dairy cattle breeders raised because the Bureau of Animal Industry dared to prevent them from scattering the disease to the four winds—and that was more than thirty years ago. What this piece is trying to declaim is that folks have a lot to learn about what livestock diseases can do to them.

"The 'Hoof'-and-Mouth Disease Fraud"

To get a slant on what's likely to take the U.S.A. for a ride, sooner or later, read what the mid-October issue of *Life* has to say about preventing the agrarian landlords of Argentina from fetching in foot-and-mouth disease. "The hoof-and-mouth disease fraud" is one of the wisecracks of the screed. Jot that one down among the diatribes you've heard about fighting animal diseases ever since Rutherford B. Hayes. Not to waste moments that ought to go to happier thoughts, let us speedily say that the piece rebukes the federal government for keeping beef out of the editor's kitchen. October, 1946, was opportune for catching attentive ears, but it's been

that way since the 1880's when cattle pneumonia was nosing its way to the Mississippi, all primed to fan out over the range country and forever keep the U.S.A. among the fourth rate nations.

Although livestock farmers and veterinarians are inured to the nescience, the unintelligent treatment livestock-disease control gets from supposedly high places too often approaches the level of an insufferable nuisance. Current food shortages is not the theme in this place. Folks in general know too little about the making of food to connect *that* with foot-and-mouth disease in the Argentine pampas.

In one respect, *Life's* funny twist of the f. and m. problem is timely. It's a signal to keep girded for the not-so-easy job of preventing our misinformed people from committing hara-kiri on the gibbet of animal plagues. But, preaching disease control to veterinarians is like carrying coals to Newcastle.

And another thing has to be told—the motive. Were mere dollars-in-sight the motive, letting in foot-and-mouth disease would be a prolific bonanza. The cattle do not die. They just stay sick and need lots of medical care—visits, medicines an' everything. Let down the bars and the D.V.M.'s would welter in clover. A Normandy practitioner told this reporter that aphthous fever was his trump card, and that was before vaccination was added to the cost of having that plague on the farm. Draw a graph of vaccinating the dairy- and beef-cattle herds of the United States. What a dream that would be for the greedy! So, disagreeing with *Life's* misinformation about f. and m. can't be charged up to either money or votes, on the part of the veterinarian.

Why make a martyr of the Argentine? All countries are treated alike in this respect. We just don't like animal plagues on our playground. We are taught in the pre-medic year that nations that do not maintain a disciplined veterinary service are a menace to those which do. So, strict livestock sanitary work is here to stay if the misinformed don't get too numerous to upset the applecart. The danger lies in common sense and good government being overtaken by money hunger, come what may.

And, here is a hunch. Never mind armies and ordnance and smart diplomacy. Establish a first rate veterinary service — colleges, laboratories, clinics — and the rest will come natural. Russia has the largest veterinary service of all times.

Pharmacodynamics of Vitamins

The dynamics of vitamins in therapeutics may be getting clarified (or are they?) but in the orthodox taxonomy of the materia medica they are yet to be put in order, meaning in respect to what drugs do to the living body or its functions. These mighty agents ought to get "taxonomized" somehow, or the classification of medicinal agents ought to be revised or readjusted in order to know where to seat the new guests. There is thiamin, the nervine, folic acid, the hematinic, and vitamin K, the hemostatic but, it seems, there is no place to seat all the rest except in the big stadium of the alteratives which takes in anything that tickles the vital processes. A, B and its brood, C, and D can be seated among the alteratives.

New Medical Journal—A First

The latest professional journal of the proximal echelon is the *Journal of the American Women's Medical Association*, Volume I, No. 1, which appeared in April, 1946. It has an editorial staff of 37, eight of whom are from foreign countries. A1 on all counts is the rating. Dr. Elise L'Esperance, long known for her work on cancer at the Memorial Hospital and New York Infirmary for Women and Children, New York City, is the editor. April having been designated as cancer month by President Truman and the Congress, the first issue was devoted mainly to that disease.

Eight Point Solid

In view of the stringency in the paper industry, the editors have found it necessary, beginning this month, to use 8 point solid type in the Current Literature and The News sections, and also in certain parts of manuscripts.* This policy will be continued until such time as the limitations are lifted from paper stock, which may be within 1947.

*Articles appearing in this issue set in 9 point type were in type previous to the decision to use 8 point where possible.

CURRENT LITERATURE

ABSTRACTS

Sudden Death in Cattle with Traumatic Injuries of the Forestomachs

Perforations of the reticulum by foreign bodies are usually found in the anterior or ventral walls of the organ. In these areas, there are no major vessels, which accounts for the infrequency of internal hemorrhage in cases of traumatic gastritis of the common type. Perforations of the reticulum may be complicated by atony, especially if the foreign body takes a direction other than the usual one and injures a nerve or if motor nerves are involved in abscesses that occur. The author describes 6 cases of sudden death in cattle due to internal hemorrhage caused by foreign bodies passing through the wall of the reticulum. In 5 cases, the course of the penetrating object was such that the left gastroepiploic artery was ruptured. The sixth case died suddenly of cardiac tamponade resulting from perforation of the right coronary artery.—[*Bengt Stinson: Sudden Death in Cattle with Traumatic Injuries of the Forestomachs. Skand. Vet.-tidskr., 35, (Oct., 1945): 622-628.*]

ALFRED G. KARLSON.

Occurrence in Animals of Hemolytic Streptococci Belonging to Group G

Certain groups of streptococci in the Lancefield classification are peculiar to pathologic processes in man, and others are peculiar to animals. In animals, the most important are: (1) Group B which causes most of the mastitis in cattle; and (2) Group C to which belong the streptococci found in pyogenic processes in all types of livestock. In man, Group A is the cause of the majority of streptococcal infections. It is possible, however, to find in animals a typical human Streptococcus and vice versa. The author examined strains of streptococci from various infections in animals and found that most of them, except in mastitis, were of Group C.

Streptococci identified as belonging to Group G were isolated from 6 foxes, 4 dogs, and 1 pig. They were regarded as being responsible for disease in the foxes and dogs, but the etiologic significance in the pig was doubtful. The strains isolated from foxes and pigs hydrolyzed sodium hippurate which has not been reported for Group G of human origin. The canine strains failed to give this reaction. Sorbitol and trehalose were decomposed by two canine strains. The author states that streptococci of Group G are of pathogenic importance in animals and that further investigation must be made to determine if the members of the group are of animal or human origin. Furthermore, it must be determined if strains able to decompose sodium hippurate belong to a specific animal group.—[*Ola Grini: Occurrence in Animals of Hemolytic Streptococci Belonging to Group G. Skand. Vet.-tidskr., 35, (Oct., 1945): 614-621.*]

ALFRED G. KARLSON.

Avirulent Anthrax Vaccine

The author describes the production and use of more than 30 million doses of an avirulent anthrax vaccine which surpassed the spore vaccine of the Pasteur type. In the last three years, there were but five deaths traceable to vaccination and two complaints of insufficient immunity among the reports received. The technique of preparation and the method of obtaining avirulent variants were described in 1937. The strains were preserved by drying frozen specimens. The cultures were kept on agar slants under paraffin. The vaccine was prepared by inoculating broth suspension of 24-hour cultures onto casein hydrolysate agar. The hydrolysate, tryptic digest of casein, and yeast brew were merely mixed with water and agar, a simple and economical medium. In forty-eight hours, sporulation was usually complete. The vaccine was harvested on the third day by washing with normal saline solution, then twice the amount of glycerin was added and adjusted to contain 6×10^8 spores per cubic centimeter. A guinea-pig test of the stock suspension and also a field test on large animals were made as a precaution. The same vaccine was used on all domestic animals and the results far surpassed former types of anthrax vaccines used.—[*Max Sterne, Section of Bacteriology, Onderstepoort: Avirulent Anthrax Vaccine. Onderstepoort J. Vet. Sci. and Anim. Indust., 21, (March, 1946): 41-43.*]

Bovine Tuberculosis in Man

Ravenel (1902) was the first to isolate the bovine type of tubercle bacillus from human lesions, finding them in abdominal tubercles of a child dead of tuberculous meningitis. Thereafter, it was soon established that extrathoracic tuberculous lesions frequently are caused by the bovine type of the bacillus, but up to 1922 only 4 cases of pulmonary tuberculosis in which the bovine type of organism was active had been reported. In 1932, Griffith reported 1,040 cases of pulmonary tuberculosis among which 2.3 per cent were of bovine origin and, in 1937, he reported on 163 such cases in Great Britain. In 1935, Jensen described

26 cases in Denmark, and he later reported presence of the bovine type bacilli in the gastric content of 5 per cent of 1,774 cases of pulmonary tuberculosis. Ruys studied 204 cases of pulmonary tuberculosis in Holland and found bovine type organisms in the sputum of 6.4 per cent of them. In Germany, Lange reported that, among 40 cases of pulmonary infection among stable boys and milkers, 8 (20%) were caused by the bovine type of tubercle bacillus.

Hedvall, studying this problem in Sweden, found the bovine type of tubercle bacillus in 94 human patients ranging in age from 3 to 68 years. These 94 cases constituted about 6 per cent of the typed specimens from a large group of patients suffering from pulmonary tuberculosis, and led him to conclude that the former belief that the bovine type of tubercle bacillus has a low virulence for man is untenable. Moreover, of the 94 patients, 53 had pulmonary lesions while the others had lymphadenitis, acute miliary tuberculosis, tuberculous meningitis, exudative pleurisy, peritonitis, and infections of the bones, urogenital tract, and lungs.

Detailed studies were made on 67 cases, and it was found that 53 occurred among the rural population, of which 43 had direct contact with infected animals. Hedvall also demonstrated that the bovine type of tubercle bacillus can be transmitted from cattle to man, from man to man, and from man back to cattle.

The report concludes with this statement: "Obviously, the marked reduction of certain forms of tuberculosis in man in the United States is in no small way due to the veterinarians' control of the disease in cattle. This has been so effective that at present only approximately 0.2 per cent of the cattle in this country are infected with tubercle bacilli."—[*Erik Hedvall: Bovine Tuberculosis in Man. A Clinical Study of Bovine Tuberculosis, Especially Pulmonary Tuberculosis, in the Southernmost Part of Sweden. Acta Med. Scandinav., Supplementum 135, Mercators Tryckeri, Helsingfors, (1942): 239. Abstracted by J. A. Myers, M.D., in Am. Rev. Tuberc., (March, 1946): 271.*]

A Survey of Literature from Holland

[*The following is a continuation (see January* JOURNAL, *p. 40) of a survey of the Tijdschrift voor Diergeneeskunde during the war years. Dr. Chas. H. Haasjes, Shelby, Mich., prepared the abstracts.—The Editors.*]

Potato Choke.—A valuable calf, 3 months old, choked when a potato lodged in the lower end of the esophagus. H. R. Wigersma and H. Barrau performed a rumenotomy [69, (Jan. 15, 1942): 44-46], removed the potato after cutting it into pieces with a probe-pointed bistoury, and then closed the ruminal incision. Recovery was complete in five weeks.

Foot-and-Mouth Disease Vaccine.—A method of preparing a crystal-violet vaccine for use in the control of foot-and-mouth disease is described by L. deBlieck and Jacob Jansen [69, (Jan. 15, 1942): 47-55]. The best results were secured from the use of epithelial tissue containing virus, and these results are said to be better than those secured through the use of Waldmann vaccine. Additional study is indicated.

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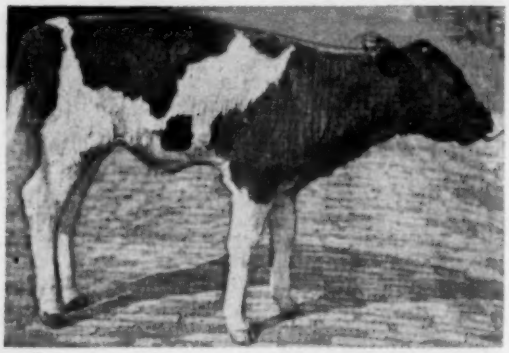
Epitheliogenesis Imperfecta Linguaebovis.—In an abstract of a thesis prepared by Th. De Groot [70, (Jan. 1, 1943): 1-10] in fulfillment of the requirement for the D.V.M. degree, the



—*Tijdschrift voor Diergeneeskunde.*

Smooth tongue, wrinkled skin of calf showing the hereditary condition Epitheliogenesis imperfecta linguaebovis.

author describes a condition in which the tongue is smooth because it is completely devoid of papillae. This interferes with prehension and with the nutrition of the animal. It is produced by a single recessive character and can be eliminated by removing the homozygous smooth-tongued animals from the breeding program.

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Sterility in Cattle.—H. ter Borg describes an enzoötic sterility in cattle [70, (Feb. 1, 1943): 40-54]. It is characterized by catarrh of the mucous membranes of the uterus, cervix, and vagina. It does not appear to spread from cow to cow, but from bull to cow. As many as 90 per cent of the cows bred to an infected bull may be returned for service, some before three weeks, some at the regular interval, and some after abortion at from four to twelve weeks of pregnancy.

A Streptococcus was mentioned as being present during the period of active inflammation and, in a few instances, in the genitalia of bulls at postmortem examination. (Trichomoniasis was not mentioned.—*Editors.*)

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Listerellosis in Rabbits.—Three cases of listerellosis in rabbits were observed and described by Jacob Jansen and G. F. von der Hurk [70, (Oct. 1, 1945): 106-114]. *Listerella monocytogenes* was isolated and proved to be pathogenic for rabbits, causing abortion.

Mourning Issue.—One entire issue [70, Dec. 1, 1945] was dedicated to veterinarians who died as a result of the war. The number known dead is 34, most of whom died in concentration camps or for violations of the Nazi law. The number includes John B. Hardenbergh, director of Research and Marine Biology, Dutch East Indies; L. Van Es, chief scientist of Vulcanology, Java; and the Baroness van Hardenbroek van Ammerstol, a small animal specialist.

The situation in the veterinary field is desperate because the number of veterinarians originally present was small, and now the ranks are depleted still further. There is no immediate prospect of improvement because 42 veterinary students disappeared also and were never heard from.

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Testosterone in Hens.—J. Grashuis and Th. J. De Man discuss the results of injecting testosterone and gestyl (a P.M.S. preparation) into laying hens [70, (Dec. 15, 1945): 321-348]. Egg production was depressed, the uninjected control birds having the highest production record in each trial.

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Contagious Diseases.—A survey of the instances of animal disease in Holland [70, (Dec. 15, 1945): 345] indicates that mange (sarcoptic and demodectic) is the most common condition from the standpoint of premises infected and animals involved. Footrot in sheep ranks second, foot-and-mouth disease is third. Hog cholera was reported on only two farms, and there were no cases of anthrax.

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Salt Poisoning in Cows.—A. M. Ferens [71, (Jan. 1, 1946): 5-16] maintained dairy cows on water containing 1 per cent of common salt for eighty-four days, but when the salt content was raised to 1.5 per cent the cows refused water for twelve days. When they did begin to drink it, they exhibited symptoms of salt poisoning—nervous irritation, loss of rumen infusoria, and diarrhea.

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Improving Pork Storage.—The Agricultural Laboratory, Copenhagen, Denmark, found [71, (Feb. 1, 1946): 144] that pork may be stored more readily and for longer periods if the glycogen content of the muscles is high at the time of slaughter. To this end, 2 lb. of sugar were administered at the slaughter house on the day of slaughter. The glycogen of the muscles changed to lactic acid which improved the keeping quality, as well as the flavor, of the pork. Refrigeration is not needed for the preservation of pork so handled.

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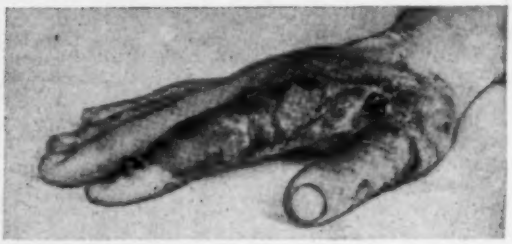
Coital Exanthema.—J. P. De Vries describes a serious form of coital exanthema, and his records show that at least 24 of 47 mares served by an infected stallion were infected with the virus [69, (June 15, 1942): 412-413]. The infection spread to 3 colts and 2 cows by extragenital contact and to the hands of the owners of 2 horses. The condition of one of these hands is shown.

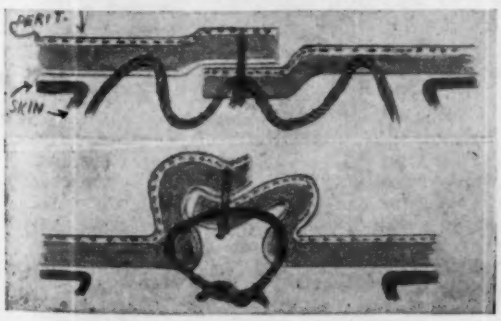


—Tijdschrift voor Diergeneeskunde.

Hand of man who cared for infected horses. Thumb and index finger show numerous abscesses.

Abdominal Hernia in Horses

To clarify the abstract on this subject which appeared in the January JOURNAL (p. 43) the illustration is published again, with the skin and peritoneum more clearly indicated.



Wartime European Chronicles*

Pathogenesis of Sidebone.—Seventy-five per cent of 40 cases of ossification of the lateral cartilages (sidebone), studied by Muller (H.), started at the basilar process and 25 per cent, or 10 of the cases, at islands of fibrous tissue independent of the os pedis by osteogenic metaplasia. Normally, these cartilaginous structures retain their elasticity through life by virtue of the fibro-cartilage losing its power to form osteoblasts.—[*Muller H.: Pathogenesis of Side Bone. Tierärztl. Rundschau., Jan., 1939.*]

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Granular Conjunctivitis of Lambs.—The epizoötiology of granular conjunctivitis of ruminants, notably of sheep, which is due to *Rickettsiae conjunctivae*, was reported by Donatien and Lestoquard. Under natural conditions, lambs are infected with the specific agent from the time of birth, either by the dam or their congeneres. The organism can be isolated in the newborn within a few hours after delivery, and all lambs may be considered infected. The duration after the first infection is long—two months. Attacks in ewes after service or in other adults are reinfections. There are all degrees of severity. Infected epithelial cells can be obtained from the pituitary membrane during the course of the attack.—[*Donatien and Lestoquard: Granular Conjunctivitis of Lambs. Bull. Soc. path. exot., 32, (1939):304-310.*]

*These abstracts appeared in *Receuil de médicine vétérinaire*, Paris, and represent important research work in veterinary medicine conducted during the wartime blackout. They cover abstracts from foreign journals other than English. They were translated by the editors.

Polyarthritis in Swine.—Although Cornevin in 1885, Bang in 1891, Stutzle in 1904, Poels in 1912, Sekiguchi and Irons in 1917, wrote of arthritis in swine, it was not until 1926 that some importance was attached to the subject through the reports of Ward, Eisenmann, Postma, Steddon, Kinsley, Zoubek, and others from 1927 to 1930. It was, however, not until Lesbouyries and Pincemin (1931), Dicksbury (1934), Meyerhoffer (1935), Wernery (1937), Kernkamp (1937), Shanks (1939), Collins and Goldie (1940) that its true relationship to swine erysipelas became common knowledge. Much of the knowledge acquired and reported by these authors came out of the abattoirs. Verge and Drieux published a lengthy review of their researches under the name *"Recherches sur les polyarthrites de Porc"* touching all phases of its various angles, which brings out a contradiction of the too general impression in this country that practically all of polyarthritis of hogs can be dismissed as a manifestation of swine erysipelas, for, this study shows that only 34 per cent of infirmity is due to *Erysipelothrix rhusiopathiae.* The remainder were traced to other infections or listed as "cause unknown." In another study by the veterinary service of the Department of Seine, out of 29 hogs only 9 were due to the erysipelas bacillus, 5 were streptococcic, 2 staphylococcic, 1 colibacillary, 1 to an unidentified gram-negative organism, and 11 sterile.—[*Verge and Drieux: Research on Polyarthritis in Swine. Réc. Méd. Vét., 96, Oct., 1940.*]

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Leucosis of Lactation in Sows.—Leucosis in swine is rarely described because most all swine are slaughtered before the secondary changes by which it could be recognized can develop. It is, therefore, a surprise to find a case of lymphadenosis at the abattoir owing to the small proportion of brood sows slaughtered, and the absence of descriptions of the mammary alterations. Lesions of a leucotic character appear in the mammae during lactation in sows precisely the same as in cows, but only a histologic examination assures a diagnosis.—[*Dr. O. Gaus: Leucosis of Lactation in Sows (title translated). Deutsche. tierärztl. Wchnschr., 8, (April, 1939) : 340.*]

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Prophylaxis and Treatment of Sterility in Mares.—One of the gripping problems of the war was sterility in mares. The article by Berthelon testifies to that effect. Pointed out first off is the high percentage of sterility there was to be corrected in the continental countries to reach the wartime objective in animal production. As of Germany and France, the default being 40 to 60 per cent, "specialists were charged with studying the question of sterility in mares in the public interest." Among the brood mares of France, infecundity from variable causes was so marked that the birth rate was maintained only by multiple services for each pregnancy. The article touches the subjects of irregular estrus, frigidity, genital atony, infantilism, persistent hymen, vulvar deformity, metritis, nymphomania, ovarian cysts, *et al.* The employment of experts in equine sexology to work on these problems among the breeding farms and villages is mentioned.

A unique practice never before published (to our knowledge) was the prevention of coitus in incurably barren mares by surgical closure of the superior commissure of the vulva and marking them off the brood-mare population in order to lower the proportion of nonbreeders. In some districts, the percentage of infecundity was lowered from 60 to 20 per cent.—[*Berthelon: Prophylaxis and Treatment of Sterility in Mares. Réc. Méd. Vét., Nov., 1940.*]

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Quintuplet Calves.—Five calves, 2 males and 3 females, enclosed in one chorion were delivered *post mortem* from a cow sacrificed on account of antepartum paraplegia. The case was described by Keller, Neidorba, and Schotterer, who stress the rarity of normally terminated multiple gestation in domestic Bovidae. As a rule, the dam aborts nonviable fetuses in such events. Vascular bridges connected the umbilical arteries, and the chorionic fusion was more precocious than in twins. The weight of the fetuses was 15 per cent of that of the dam as compared with the usual 8 to 10 per cent for single calves or twins. The females were more or less masculinized, that is to say, they were intersexual as is generally the case for females developed at the side of male fetuses. Although a paraplegia interrupted normal delivery, the case is one to record.—[*Keller, Neidorba, and Schotterer: Quintuplet Calves. Deutsche. tierärztl. Wchnschr., Jan., 1940.*]

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On the Action of Flukicides.—Researches by Hasseo and Turgay on the dynamics of remedies employed in the treatment of hepatic distomiasis showed that there is no relation between their flukicide properties *in vitro* and *in vivo.* The drugs tested were dissolved in benzol which does not alter the action. Kamala and filicine are more active *in vitro* while carbon tetrachloride, which is quite active against flukes in the bile ducts, does not kill the living flukes of the laboratory exposed to a 1 per cent solution for twenty-eight minutes. Hexachlorethane, arecoline, santonine, oil of chenopodium, and terebinthina were more efficacious than the carbon compounds.—[*Hasseo and Turgay: On the Action of Flukicides. Berl. tierärztl. Wchnschr., (Jan., 1940) : 28.*]

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Contribution to the Study of Goiter.—Goiter is a common malady of colts in the region north of Brest (France). Hypertrophy of the thyroid, sometimes present at birth, develops in fifteen days to a month to the size of a hen's egg and increases in fifteen to sixteen months to the size of a man's fist, remains static for a time, and then, with rare exceptions, begins to diminish gradually to the dimension of the normal gland. Except for the esthetic factor, the trouble causes no inconvenience. One has but to wait for spontaneous recovery.

Despite the multiplicity of cases, the etiology remains obscure. The richness in iodine of the atmosphere and marine plants which the horses consume voluntarily bring up the matter, not of iodine deficiency, but of an excess of that metalloid stored in the gland.—[*Jacob: Thesis. Paris, 1940. Réc. Méd. Vét., (Nov., 1940): 431.*]

BOOKS AND REPORTS

Veterinary Education in Europe

The text of this book is an epitome of a survey of veterinary education in Europe made during the college year of 1937-1938 as a starting point of worldwide treatment of the subject. The declared object was the profound repercussions that have come upon animal production in recent years, to which veterinary education must adapt itself. As in other professions, national and international congresses, official commissions, and professional journals have been preoccupied in planning education applicable to the exigencies of professional practice.

To evaluate the evolution of the new order, the author points out the necessity of collecting facts on the stature of veterinary education in the different countries, the current trends, the results attained, and the desirable transformations to be achieved. Regret is expressed that in veterinary medicine no steps have been taken to bring about an understanding of the veterinary colleges of the world, their program, their pedagogic methods, and their material facilities. The treatise, consecrated as it is to the task of filling the lacuna created in the natural course of time, is a reminder of the smallness of the present world and its effects on the problems of veterinary education in the principal nations. All of this is prewar reaction which can now be applied in principle to a postwar situation which the most far-seeing author could not have anticipated when this book was written.

This book is a prize, not only for the utilitarian information it contains but because, like a rare postage stamp, it was published, copyrighted, and distributed by German sanction during the military occupation of Paris, the birthplace of veterinary education.

In allocating space, the author gives 22 pages to Germany, 14 to Great Britain, 12 to Italy, 11 1/2 to Jugo-Slavia, 9 each to France and Belgium, 7 1/2 to Poland and Switzerland, 6 each to Denmark, Holland, Hungary, and Czechoslovakia; 4 each to Bulgaria, Turkey, Spain, and Sweden; and 3 1/2 each to Norway and Rumania. This allocation of space draws a true outline of veterinary education in Europe. The space allocated to Germany is not chargeable to partiality since Germany had seven large veterinary colleges (including Vienna), a population of 70 million, 65 million herds of farm animals, 8,500 veterinarians, and a density of 1 veterinarian per 65 km.^{2} of area. In short, in 1941 Germany was by far the top veterinary country in the world.

This booklet is the most complete summation of the stature of veterinary education in Europe. The salient facts about veterinary colleges are epitomized as to date of origin, their governmental connection, the requirement for admission, the branches taught and hours devoted to each, the number of students as of 1937-1938, total veterinarians, the number of veterinarians per animal population and per square kilometer. The whole is a compilation of facts invaluable to the agricultural economist, the historian, the college officials, committees on education, and the casual veterinarian who wants to know a thing or two about the status of his *métier*.—[*L'Enseignement Vétérinaire en Europe (Veterinary Education in Europe). By Professor C. Bressou, Director of the National Veterinary School of Alfort. Paper bound. 175 pages. 11 tables. Vigot Frères, 23 rue de l'École-de-Médecine, Paris VI, 1941.*]

Iowa Year Book of Agriculture

If for pleasure, pastime, or profit you want to read a book crammed with thrilling facts, original ideas, and useful lore and learning, get a load of what Iowa farmers have done to and with 22,600,000 acres of arable land the last hundred years. This scrivener has long contended that to understand the dynamics of the U. S. A., one must first know the history of Ohio and Iowa agriculture. As to the latter, here it is, just off the press, in the current report of Secretary of Agriculture Harry D. Linn to His Excellency Robert D. Blue, Governor of the state, in which Dr. C. C. Frank, chief of the Animal Husbandry Division, figures in a large way.

There's no space here for a critical review of so complete a story of what's what in Iowa agriculture, where everything zoo-agrarian grew like fungi to stratospheric figures in so short a spell, and where methods stagger the imagination of one who saw the Indians move out and hog cholera move in. To the humble yeoman of the one-bottom plow (with handles), rail fences, and 10-acre fields, there is something fantastic about 11,071,000 acres planted to hybrid corn (home-invented), 20 per cent of the country's hogs, 5,000,000 cattle, 1,600,000 sheep, 38,000,000 chickens, 214,000 turkeys, 536,000 horses and mules, and a dairy industry that's giving an account of itself in all company.

What's the secret of Iowa's place in the sun? The answer is (1) large scale drainage, (2) polybottom plows and big hitches, and (3) no compromise with diseases of farm animals. Everything else is detail. The sum is basic American history more precious than the kind stuffed into school children in so-called education.

The part on veterinary medicine (Part 3) by Dr. Franks contains a wisely conceived compilation of the contemporary animal-disease situation since 1884, arranged and described chronologically, in addition to the problems in hand and a sizeable personnel engaged in handling them: a chief with a large clerical staff, 12 state veterinary inspectors, and 20 federal coöperatives—quite a contrast to 1884, when Dr. M. Stalker, practically alone, established himself at Ames in the rôle of dean of the department of veterinary medicine, Iowa State College, and state veterinary surgeon, thereby starting Iowa's first effort to control farm-animal diseases. The importance of this report to the veterinary circle is the period from Stalker (1885) to Frank (1946) which is briefed into a few pages.—[*Forty-Sixth Annual Iowa Year Book of Agriculture, 1946. Cloth. 743 pages. Official document of the State of Iowa, Des Moines, 1946.*]

THE NEWS

The 1947 Convention in Cincinnati

Date—Aug. 18-22, 1947 *Headquarters—Netherland Plaza*

Good progress is being made on the early planning for the eighty-fourth annual meeting in Cincinnati this year. Officers and chairmen of the Committee on Local Arrangements have been selected, the Program Committee (section officers) is at work on material for the scientific sessions, and official announcements and floor plans for the commercial and educational exhibits will be mailed early in March. A notice regarding contributions to the scientific programs was published in the January JOURNAL (p. 49).

The Committee on Local Arrangements

OFFICERS

General Chairman.—A. G. Madden, Jr., 7242 Miami Ave., Madeira, Ohio.
Vice Chairman.—R. G. Kerans, 2590 Duckcreek Rd., Norwood, Ohio.
General Secretary.—John L. Jones, 644 E. McMillan St., Cincinnati, Ohio.

COMMITTEE CHAIRMEN

Exhibits.—S. W. Stout, 317 N. Erie Blvd., Hamilton, Ohio.
Entertainment.—J. A. Winkler, 1034 Monmouth Ave., Newport, Ky.
Hotels and Housing.—Sol G. Stephan, 2824 Vine St., Cincinnati, Ohio.
Garages and Parking.—G. C. Lewis, 7121 Paddock Rd., Carthage, Ohio.
Meeting Rooms and Equipment.—J. H. Batche, Board of Health (City Hall), Cincinnati, Ohio.
Military Activities.—Col. S. C. Dildine, V.C., U.S.A. (Retired), Canal Winchester, Ohio.
Motion Pictures.—Byron W. Bernard, 644 E. McMillan St., Cincinnati, Ohio.
Publicity and Public Relations.—Carl A. Pleuger, 2146 Freeman Ave., Cincinnati, Ohio.
Reception and Hospitality.—A. R. Theobald, 4545 Reading Rd., Cincinnati, Ohio.
Registration and Information.—John F. Gest, Bureau of Animal Industry, Cincinnati, Ohio.
Women's Activities.—Mrs. R. G. Kerans, 2548 Madison Rd., Cincinnati, Ohio, and Mrs. A. R. Theobald, 1735 Bella Vista, Cincinnati, Ohio.

(Continued on next page)

Cincinnati Skyline as Viewed from the Kentucky Shore

TENTATIVE PROGRAM ARRANGEMENT

The following preliminary schedule will serve as a guide to those making early hotel reservations:

Saturday and Sunday, August 16-17.—Meetings of Board of Governors, Executive Board, and various committees.

Monday, August 18.—Registration, opening of exhibits, sessions of House of Representatives, and Opening Session.

Tuesday through Thursday, August 19-21.—Section meetings, general sessions, various entertainment features, and Women's Auxiliary.

Friday, August 22.—Post-convention activities (tentative).

HOUSING BUREAU WILL HANDLE HOTEL RESERVATIONS

The Cincinnati Convention Bureau and seven of the leading hotels in the city have guaranteed a minimum of 1,200 rooms for occupancy during the convention. Because a record-breaking attendance is likely, a housing bureau has been set up in the convention bureau office, which will function under the chairmanship of Dr. S. G. Stephan. No Cincinnati hotel will accept or confirm any reservations for the AVMA convention except those that are cleared through the Bureau.

A hotel reservation blank is printed in the advertising section, page xxxiii. This is the official form and use of it will facilitate the handling of requests. Since the number of single rooms is limited, convention goers are urged to arrange for double occupancy wherever possible and, if necessity arises, single registrants will be expected to share double rooms.

The Netherland Plaza will be convention headquarters, but this hotel can accommodate only a part of the assemblage. However, the several other principal hotels which have allocated rooms for the convention are most conveniently located, as shown in the diagram accompanying the reservation blank; with one exception, all these are within two blocks of convention headquarters. All requests for rooms will be handled in the order in which they are received, but persons making reservations should allow ample time for acknowledgment and confirmation.

Research Council Meeting

The AVMA Research Council met at the Palmer House in Chicago on Dec. 3, 1946. Members present were: Drs. E. T. Hallman, C. A. Brandly, H. H. Dukes, M. A. Emmerson, James Farquharson, W. F. Guard, R. A. Kelser, Hadleigh Marsh, Edward Records, L. E. St. Clair, C. F. Schlotthauer, and C. P. Zepp, Sr. Also present were Dr. B. T. Simms, president of the AVMA; Dr. J. V. Lacroix, treasurer; and Drs. J. G. Hardenbergh and R. C. Klussendorf of the AVMA offices.

Dr. Simms greeted the group and expressed the hope that research workers in veterinary fields could be protected from Selective Service at the next draft.

It was announced that the Council chairman had appointed Dr. Schlotthauer to succeed Dr. M. L. Morris on the Committee on Fellowships.

A letter from Dr. W. H. Riser inquiring about small animal research sponsored by the Research Fund led to discussion on that phase of the research projects. Fellowships, methods of appointment, stipend, and shortages of suitable equipment were also subjects for general discussion.

Dr. Farquharson presented a statement from the National Livestock Loss Prevention Board and other agencies concerning proposals for ox-warble fly research at the South Dakota Agricultural Experiment Station, and requests for support in the work from the Research Council.

Dr. W. H. Feldman of the Mayo Foundation spoke on the opportunities offered in the study of veterinary pathology at the Army Institute of Pathology in Washington, D. C. There is a lack of men trained in tissue pathology, and professional groups are requested to send fellows to the Institute.

The following officers were reëlected: Dr. E. T. Hallman, *chairman;* Dr. R. A. Kelser, *vice-chairman;* and Dr. H. H. Dukes, *secretary.*

s/H. H. DUKES, *Secretary.*

Cincinnati Program

Section officers (*see* November JOURNAL, p. 413) are working on programs for the eighty-fourth annual meeting to be held at Cincinnati, Aug. 18 to 22, 1947. Members who have appropriate material to present, or who know of persons possessing such material, are urged to communicate this information to the section officers or directly to the central office of the AVMA.

Preliminary plans are progressing rapidly and on an extensive scale. A wide variety of subjects will be presented, and every veterinarian who renders a service which demonstrates the diversity of the activities of the profession is urged to tell his colleagues about his work.

Foot-and-Mouth Disease Quarantine

The Mexican border was closed on Dec. 31, 1946, and an order of quarantine was issued which has the effect of excluding from the United States, cattle, sheep, goats, swine, fresh meat, and other specified products originating in Mexico. This was done by Dr. B. T. Simms, chief of the BAI, because veterinarians from his staff had determined that foot-and-mouth disease exists in Mexico.

Foot-and-mouth disease is known to be prevalent in at least three states near Vera Cruz and Mexico City, where it gained entrance with two shipments of Zebu bulls from Brazil which had not been held in quarantine for the period specified in the Mexico-United States Sanitary Treaty.

Are Veterinarians Interested?

Sadly enough, too few nominations have been made the past three years for the Humane Act Award. Cannot members of the AVMA generate more enthusiasm for this award and, by many nominations, make it a coveted prize to be awarded annually? Look around for new nominees. In your practice, there are undoubtedly several who could measure up to the specifications, which are: the boy or girl should not be over 18 years old; he

or she must have done a kind act (not necessarily a rescue) to an animal or animals.

The past three winners were: Frank Kiemle, Chicago, 16 years old, who, with his young sister, edited and published *Pet News;* Tim Suter, Pittsburgh, 15 years old, who rescued a dog from a sewer; and 15-year-old John Newton, Columbus, Ohio, who established National Cat Week.

Nominations must be in by May 1, 1947. Help the committee (Dr. W. A. Young, *chairman*, Chicago; Dr. J. A. Campbell, Toronto; and Dr. E. F. Schroeder, Arlington, Mass.) make this a live issue; it's wholesome for you and the profession. Send your nominations to: The AVMA, 600 S. Michigan Ave., Chicago 5, Ill., before May 1.

APPLICATIONS

The listing of applicants conforms to the requirements of the administrative by-laws — Article X, Section 2.

First Listing

ARANEZ, JOSE B.
Tanauan, Batangas, Philippines.
D.V.M., University of the Philippines, 1946.
Vouchers: A. K. Gomez and A. C. Gonzaga.

BATSCHE, JOSEPH H.
3962 Lowry Ave., Cincinnati 29, Ohio.
D.V.M., Cincinnati Veterinary College, 1912.
Vouchers: S. G. Stephan and J. L. Jones.

BUIE, ROBERT C.
Boerne, Texas.
D.V.M., Texas A. & M. College, 1946.
Vouchers: L. E. Thompson and J. C. Kelley.

DUNLAP, MARY K.
423 West 59th St., Kansas City, Mo.
D.V.M., Michigan State College, 1933.
Vouchers: A. H. Quin and J. V. Lacroix.

HICKMAN, WILLIAM M.
605 Garrard St., Covington, Ky.
D.V.M., Cincinnati Veterinary College, 1918.
Vouchers: J. A. Winkler and T. P. Strittmatter, Jr.

MCBRIDE, ANDREW L.
4936 Pine St., Omaha 6, Neb.
D.V.M., Kansas State College, 1931.
Vouchers: V. V. Golden and S. Kelsall.

PAS, HAROLD H.
21 Livestock Exchange Building, Witchita 2, Kan.
D.V.M., Iowa State College, 1927.
Vouchers: H. E. Schaulis and L. E. Spong.

QUEIROZ, EDUARDO R.
Avenida Borges de Medeiros, 549 40 andar., Porto Alegre, Rio Grande do Sul, Brazil.
M.V., National Veterinary College, Brazil, 1918.
Vouchers: S. Torres and R. C. Klussendorf.

SCATTERDAY, JAMES E.
P. O. Box 633, Gainesville, Fla.
D.V.M., Ohio State University, 1933.
Vouchers: D. A. Sanders and L. E. Swanson.

SLATKO, LEON
1816 Colonial Ave., Waco, Texas.
D.V.M., Colorado A. & M. College, 1946.
Vouchers: R. F. Bourne and J. F. Christensen.

Second Listing

Alvarez, Jose Gonzalez, Utah State Agricultural College, Veterinary Science Dept., Logan, Utah.
Ardell, J. W., Newark Valley, N. Y.,
Bernard, Byron W., 644 E. McMillan, Cincinnati, Ohio.
Carmack, Ralph W., 40 W. 36th, Indianapolis, Ind.
Chase, Charles M., 3264 Utica St., Denver, Colo.
Dowling, Edmund M., 357 Columbus Ave., Springfield, Mass.
Foose, Clarence N. Jr., P. O. Box 487, Cumberland, Md.
Moore, Charles A., 15795 Mack Ave., Detroit, Mich.

Veterinary Research Fellowships Available

The Research Council of the American Veterinary Medical Association announces that a number of veterinary research fellowships are available for the academic year 1947-48.

Holders of fellowships must be veterinarians and citizens of the United States or Canada. Veterinary students who expect to graduate at the end of the current school year may apply for fellowships for the following year. The last date for filing applications for the year 1947-48 is March 1, 1947.

The Committee on Fellowships of the Research Council will meet early in April to consider applications and to award fellowships. Applicants will be notified of the action regarding their applications not later than May 15,—in most cases earlier.

The stipend of the fellowships will be determined by the needs of the individual fellows, the location of the schools at which they propose to work, and other factors; they will range from $150 per month upward.

For information concerning the fellowship project of the Research Council, see the February, 1946, JOURNAL, p. 107.

For application blanks and other information write:

Dr. H. H. Dukes, Secretary
A.V.M.A. Research Council
N. Y. State Veterinary College
Cornell University
Ithaca, New York.

Naughton, John J., 1623 Clay Ave., Scranton, Pa.
Pleuger, Carl A., 2146 Freeman Ave., Cincinnati 14, Ohio.
Polak, Marvin P., Box 1101, Riverdale, Calif.
Smokler, David G., Rt. No. 2, Dallas, Texas.
Strang, George J., 50 Brown St., Lewisburg, Pa.
Talavera, Juan, Calle Iturbe 14, Madrid, Spain.
Wilcox, Adelbert E., 2105 S. 50th St., Lincoln 6, Neb.

1947 Graduate Applicants
First Listing

The following are graduates who have recently received veterinary degrees and who have applied for AVMA membership under the provision granted in the Administrative By-Laws to members in good standing of junior chapters. Applications from this year's senior classes not received in time for listing this month will appear in later issues. An asterisk (*) after the name of a school indicates that all of this year's graduates have made application for membership.

Kansas State College*

BALLENTINE, JACK G., D.V.M.
210 Clark St., Bonner Springs, Kan.
Vouchers: E. E. Leasure and R. R. Dykstra.

BARRY, JAMES W. JR., D.V.M.
5000 Wells Rd., Kansas City 3, Kan.
Vouchers: E. E. Leasure and E. J. Frick.

CARNES, JOHN F., D.V.M.
2702 W. Okmulgee, Muskogee, Okla.
Vouchers: E. E. Leasure and E. J. Frick.

CHERRY, BRAINERD G., D.V.M.
Redwood Falls, Minn.
Vouchers: E. E. Leasure and J. E. Mosier.

COMBA, LOUIS C., D.V.M.
112 E. Fourth St., Picher, Okla.
Vouchers: E. E. Leasure and E. R. Frank.

CORDERO, ROSENDO, D.V.M.
Box 275, Humacao, P. R.
Vouchers: E. E. Leasure and E. J. Frick.

CORNELL, ROBERT L., D.V.M.
662 S. McDonnell, Los Angeles 22, Calif.
Vouchers: E. E. Leasure and F. H. Oberst.

DIAZ, JOSE A., D.V.M.
Box 723, Rio Piedras, P. R.
Vouchers: E. E. Leasure and E. R. Frank.

FOGLEMAN, RALPH W., D.V.M.
Colby, Kan.
Vouchers: E. E. Leasure and F. H. Oberst.

FRAZIER, SAMUEL G., D.V.M.
Soddy, Tenn.
Vouchers: E. E. Leasure and G. R. Moore.

FREY, WILLIAM A., D.V.M.
636 E. Iron, Salina, Kan.
Vouchers: E. E. Leasure and R. R. Dykstra.

GEISLER, ORDELIA, D.V.M.
919 L, Lincoln, Neb.
Vouchers: E. E. Leasure and G. A. Ackerman.

HARDIN, CLARENCE E., D.V.M.
815 B. St., Petaluma, Calif.
Vouchers: E. E. Leasure and R. R. Dykstra.

HEBERT, BENJAMIN O., D.V.M.
505 Olive St., Menlo Park, Calif.
Vouchers: E. E. Leasure and J. E. Mosier.

HERVEY, JAMES S., D.V.M.
Belle Plaine, Kan.
Vouchers: E. E. Leasure and R. E. Witter.

HUBBS, JUNIOR C., D.V.M.
Box 453, Dorrance, Kan.
Vouchers: E. E. Leasure and E. J. Frick.

INGMIRE, CECIL W., D.V.M.
125 N. Rockhill, Council Grove, Kan.
Vouchers: E. E. Leasure and E. J. Frick.

JOHNSON, MILO L., D.V.M.
2000 Willow Ave., Topeka, Kan.
Vouchers: R. E. Witter and E. E. Leasure.

KASLOW, RUTH, D.V.M.
2080 84th St., Brooklyn, N. Y.
Vouchers: E. E. Leasure and E. J. Frick.

KELLY, ARTHUR L., D.V.M.
Carroll, Iowa.
Vouchers: E. E. Leasure and E. R. Frank.

KINARD, HAROLD W., D.V.M.
Box 413, Ruffin, S. Car.
Vouchers: E. E. Leasure and J. H. Burt.

LINDERS, ROBERT E., D.V.M.
Baldwin, Ill.
Vouchers: E. E. Leasure and G. R. Moore.

LOW, DONALD G., D.V.M.
639 Grant St., Denver 3, Colo.
Vouchers: E. E. Leasure and F. H. Oberst.

LUKE, OTTO F. JR., D.V.M.
Solomon, Kan.
Vouchers: R. E. Witter and E. E. Leasure.

MCHENRY, LESLIE J., D.V.M.
c/o Maison May, 943 1st Ave., New York, N. Y.
Vouchers: E. E. Leasure and E. J. Frick.

MCLAUGHLIN, ALVAH R. JR., D.V.M.
219 W. 7th St. Terr., Kansas City 5, Mo.
Vouchers: E. E. Leasure and J. H. Burt.

MOLES, CLYDE E., D.V.M.
3611 Walnut St., Kansas City 2, Mo.
Vouchers: E. E. Leasure and F. H. Oberst.

NAROTSKY, SAUL, D.V.M.
Columbia, Conn.
Vouchers: E. E. Leasure and E. R. Frank.

NORBY, MARVIN A., D.V.M.
207 S. Iuka, Pratt, Kan.
Vouchers: E. E. Leasure and E. R. Frank.

NORD, SEYMOUR D., D.V.M.
299 Vassar Ave., Newark, N. J.
Vouchers: E. E. Leasure and E. J. Frick.

OLIVER, PEDRO A., D.V.M.
Del Carmen St. No. 1303, Santurce, P. R.
Vouchers: E. E. Leasure and E. J. Frick.

PARKER, JACK A., D.V.M.
Byers, Texas.
Vouchers: E. E. Leasure and G. R. Moore.

PUMPHREY, OLEN, D.V.M.
Fort Branch, Ind.
Vouchers: E. E. Leasure and R. R. Dykstra.

REHFELD, CARL E., D.V.M.
Warner, S. Dak.
Vouchers: E. E. Leasure and L. M. Roderick.

RONK, HOWARD W., D.V.M.
434 Shoshone St. W., Twin Falls, Idaho.
Vouchers: E. E. Leasure and E. J. Frick.

SANTIAGO, FRANCISCO M., D.V.M.
P. O. Box 23, Penuelas, P. R.
Vouchers: E. E. Leasure and R. J. Jewell.

SCHWARTZ, WILLIAM, D.V.M.
7701 Bay Parkway, Brooklyn, N. Y.
Vouchers: E. E. Leasure and G. R. Moore.

WARREN, DALE M., D.V.M.
13 West Oak St., Fort Scott, Kan.
Vouchers: E. E. Leasure and W. W. Thompson.

WILLIAMS, IVOR, D.V.M.
2919 N. Arno St., Alburquerque, N. M.
Vouchers: E. E. Leasure and E. J. Frick.

YORK, FRED A., D.V.M.
Box 268, Panora, Iowa.
Vouchers: E. E. Leasure and R. R. Dykstra.

Michigan State College

BROWNE, JOSEPHINE, D.V.M.
1132 Third Street N., Fargo, N. Dak.
Vouchers: E. K. Sales and B. J. Killham.

U. S. GOVERNMENT

Procurement Program Ends.—Officials of UNRRA have advised the U. S. Department of Agriculture that the purchase of 18,000 mares and geldings will complete procurement in the United States of utility draft animals for European countries. Purchases made by the Department of Agriculture for the account of UNRRA since January, 1946, amount to almost 164,000 head of working animals.

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Penicillin Production.—Scheduled production of penicillin pointed to a new high level as the year closed. The Civilian Production Administration announced initial allocations for the month of December of 4,141.82 billion units. Allocations for the month of August were 2,887.73 billion units. Although export demand for penicillin is again on the increase, it is expected that there will be an ample supply to meet all requirements.

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Placement Service Merger.—The placement service of the National Roster of Scientific and Professional Personnel has been merged with the United States Employment Service National Clearing House. With this amalgamation, the USES is better prepared to meet the needs of employers for scientific, professional, and executive personnel. The objective of the service is to bring together, through 1,800 local state offices, highly qualified workers and specialized positions which cannot always be filled locally.

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Foreign Study Grants.—The Department of State has announced the availability of a limited number of travel and maintenance grants to assist United States graduate students to undertake research or academic studies in other American republics. A bachelor's degree or equivalent is required, also some graduate study and a familiarity with the language of the country chosen. Minimum residence for successful candidates will be six months; maximum grants are for a year. Application blanks (available at the American Republic Section, Division of International Educational Relations, U. S. Office of Education, Federal Security Agency, Washington 25, D. C.) should be received not later than March 1, 1947.

• • •

Fur Farmers Want Agricultural Connection.—Pursuant to the Act of Congress transferring the regulation of fur farming from the Fish and Wildlife Service to the Department of Agriculture, Minnesota fur breeders in convention assembled at Minneapolis in June passed a resolution urging that their industry be placed under the regulatory jurisdiction of the state Department of Agriculture instead of the Department of Conservation on the ground that their industry is now generally regarded as an agricultural pursuit.

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Veterinary Personnel Changes in the Bureau of Animal Industry

TRANSFER

A. K. Kuttler, from Springfield, Ill., to Washington, D. C.

RETIRED

Arthur T. Fletcher, Sacramento, Calif.

RESIGNED

William M. Anderson, Nashville, Tenn.
Burt W. Larsen, Charleston, W. Va.
Elmer L. Metcalfe, Omaha, Neb.
Donald F. Peters, Lansing, Mich.
Jake L. Reineccius, Little Rock, Ark.

AMONG THE STATES AND PROVINCES

Alabama

Conference for Veterinarians.—The School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, was headquarters for the twenty-second annual conference for veterinarians Jan. 2-4, 1947. After the address of welcome by President L. N. Duncan, the program continued with the following speakers.

Dr. W. M. Coffee, La Center, Ky.: "Building a Swine Practice."

Dr. C. E. Bild, Miami, Fla.: "Distemper in Dogs."

Dr. C. J. Rehling, state toxicologist, Auburn: "Toxicological Examinations."

Dr. A. A. Leibold, Alabama Polytechnic Institute: "Submitting Specimens for Laboratory Diagnosis."

Dr. E. A. Davis, Columbus, Ga.: "Hospital Administration"; discussion by Dr. H. W. Hayes, Knoxville, Tenn.

The following symposiums were held: cattle practice problems, with Dr. W. L. Gibbons, chairman, Drs. W. M. Coffee, F. E. Hull, B. M. Jolly, and Dale A. Porter; small animal practice problems, with Dr. E. A. Davis, chairman, Drs. H. A. Bassham, C. E. Bild, J. E. Greene, H. W. Hayes, McKenzie Heath, L. E. Irby, J. W. Thome, and H. C. Young; poultry practice problems, with Dr. A. H. Groth, chairman, Drs. G. J. Cottier, C. W. Barber, W. S. Bailey, and M. W. Emmel; and equine practice problems, with Dr. W. M. Coffee, chairman, Drs. F. G. Schell, J. L. Hopping, B. M. Jolly, and J. H. Ryland.

Special features of the clinics were: "Spaying Heifers," by Dr. C. C. Carlton; "Roaring Operation" and "Tail-Setting Operation," by Dr. J. L. Hopping, Sr.; "Preoperative Preparation of the Dehydrated Patient," by Dr. C. E. Bild; and "Barnyard Transfusion," by Dr. W. M. Coffee.

British Columbia

The Farm-Animal Situation.—The annual report of the Department of Agriculture as of

January, 1946, giving briefly the salient facts about the livestock industry, reveals a state of confusion in respect to horses. The slaughtering of considerable numbers at Edmonton and Swift Current for export, and the prospect of exporting many draft horses to European countries, makes the future of the horse situation unpredictable, although all agree that there are too many small, wild horses at large. Livestock Commissioner Dr. Walter R. Gunn (ONT '23), writer of the report, states that the light-harness horse business is active on account of the interest in racing. He also points out the advisability of using more horses in farming. Beef and dairy cattle show gains in numbers, price, and quality. The breeders of high-grade sheep have had a successful year. The breeding of hogs oscillates with methods of farming and holds at the "normal level."

Connecticut

Personal.—Dr. Stewart E. Elting (UP '43) has opened a general practice at Lakeville. He was discharged from the Army in May of 1946.

Georgia

Georgia's School of Veterinary Medicine.—On Aug. 14, 1946, the Board of Regents of the University System of Georgia authorized and directed the establishment of a School of Veterinary Medicine at the University of Georgia in Athens. At the same time, President Harmon Caldwell was directed at an early date to recommend for appointment a dean to head the new school.

This action of the Board was, in reality, the reëstablishment of a degree course in veterinary medicine which was established in 1918 and discontinued in 1933 upon the recommendation of a committee of national authorities which conducted a survey of higher education in Georgia. At that time, it was the opinion of the committee that the Southeast needed but one school of veterinary medicine and that the school at Auburn, Ala., met all requirements of the region. But ever since the school was closed, there has been an insistent demand for its reëstablishment on the part of livestock producers and young men who wished to secure training for the profession.

Immediately following action of the Board of Regents, the University of Georgia, under direction of Paul W. Chapman, dean of the College of Agriculture, took steps to begin a training program. A total of 107 students were registered for the fall quarter in preveterinary work and for the first year's professional training. All these students were residents of Georgia. It has been announced, however, that the school will accept some students next year from other states in the Southeast, but from no other region.

During the school year 1947-48, both the first and second year's professional programs will be offered. In selecting 50 beginning students for next year, preference will be given to those with two or more years of college training. This minimum, it is thought, will be made a permanent requirement for admission to the School of Veterinary Medicine.

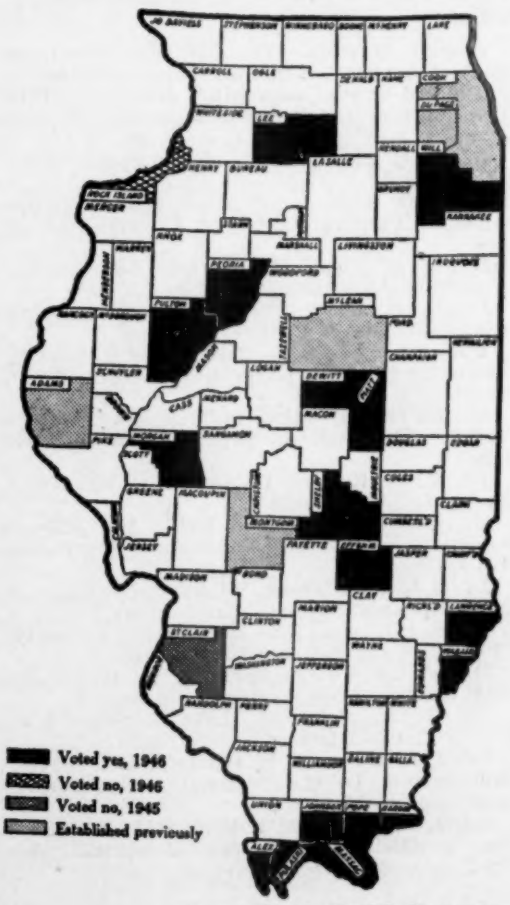
Dr. Clifford Westerfield (MSC '38), formerly associated with the U. S. Bureau of Animal Industry, the College of Veterinary Medicine of The Ohio State University, and the experiment station of the University of Kentucky, has been employed as professor of veterinary anatomy and placed in charge of the work during the current year.

Dr. K. M. Curts (TEX '41), formerly associated with the School of Veterinary Medicine, Texas A. & M. College, and recently of the U. S. Navy, has been named assistant professor of veterinary anatomy.

Other veterinarians on the University of Georgia faculty are: Dr. Thos. J. Jones (GA '33), professor of animal husbandry; Dr. W. C. Burkhart (OSU '16), professor of bacteriology, and Dr. Clifford W. Barber (COLO '31), research associate in poultry pathology. To the five veterinarians mentioned, others will be added during the spring and summer of 1947. Plans for two new buildings, which will be erected at the earliest possible date, are now being completed.

Illinois

County Health Departments.—There are now 22 counties in the state that have established health departments under the Searcy-Claugh County Health Department Law. Peoria, Will, Lee, Morgan, Lawrence, Wabash, Alexander,



—From Illinois Health Messenger.

Piatt, Pulaski, DeWitt, Effingham, Shelby, Pope, Hardin, Massac, Fulton, and Johnson counties were added to the list at the November (1946) election. Rock Island county was the only one voting which rejected the proposition. Health Departments in Cook, DuPage, Adams, Montgomery, and McLean counties had been previously established. Some of the 22 are four-county and three-county units.

Governor Dwight H. Green and Public Health Director Roland R. Gross, who are backing state-wide coverage, should be encouraged by the local veterinarians, through the Department of Agriculture or individually. The movement ought to lead to state meat inspection in slaughter houses, meat-packing, and poultry-dressing plants in which local practitioners might participate on a part-time basis, as is being done so advantageously in California.

• • •

President of '47 National Dog Week.—A well-known figure in dog circles, Mr. C. M. Olson of Chicago, an executive of Swift & Co., has been elected president of National Dog Week, Inc., which is to be held Sept. 21-27, 1947. Mr. Olson will supervise plans made by this non-profit organization during 1947, the twentieth year since its founding by Captain Will Judy, editor of *Dog World*.

Indiana

Annual Meeting.—The Indiana Veterinary Medical Association met at Indianapolis for its sixty-third annual convention Jan. 16-18, 1947. The following speakers participated in the program.

Dr. G. E. Botkin, state veterinarian: "Regulatory Work."

Dr. Glen Reed, Constantine, Mich.: "Importance of Various Phases of Veterinary Practice."

Dr. J. S. Koen, BAI, Storm Lake, Iowa: "Doubling the Profits from Hogs."

Dr. H. E. Moses, Purdue University, Lafayette: "Diseases of Poultry."

Prof. T. S. Sutton, Ohio State University, Columbus: "Recent Experimental Work in Calf Feeding."

Mr. Ed Mason, WIBC, Indianapolis: "WIBC's 'R.F.D. 1070,' Indiana Veterinarians Coöperating."

Dr. M. H. Roepke, University of Minnesota, St. Paul: "Acetonemia."

Dr. Gilbert Haigler, St. Louis, Mo.: "Mixed Infections in Small Animals' Respiratory Tracts."

Dr. O. N. Christensen, Wilmette, Ill.: "Gastrointestinal and Nervous Complications."

Dr. F. J. Kingma, The Ohio State University: "Penicillin and Sulfonamide Therapy."

Dr. Frank Thorp, Michigan State College, East Lansing, Mich.: "Sheep Diseases."

Dr. T. H. Ferguson, Lake Geneva, Wis.: "Dairy Cattle Diseases and Surgery."

Dr. J. H. Steele, U. S. Public Health Service, Washington, D. C.: "Animal Diseases Communicable to Man."

Dr. J. W. Murdock, Indiana BAI, Indianapolis: "Activities of the Bureau of Animal Industry."

Dr. E. R. Frank, Kansas State College, Manhattan: "Surgery of the Horse."

Dr. W. A. Hagan, president-elect, AVMA, New York State Veterinary College, Ithaca: "What the AVMA Means to the Veterinarian."

Dr. Paul T. White was chairman of a panel discussion on "Mixed Infections in Small Animals vs. Distemper," and was assisted by Drs. Gilbert Haigler, F. J. Kingma, and O. N. Christensen.

The following panel discussions were held: horses, with Dr. E. R. Frank as chairman, assisted by Drs. C. R. Baumgartner, J. F. Bullard, J. O. R. Campbell, and H. A. Lidikay; swine, with Dr. J. S. Koen, chairman, Drs. L. M. Hutchings, T. S. Steenerson, J. F. Roberts, and S. H. Regenos; poultry, with Dr. H. E. Moses, chairman, Drs. F. C. Tucker, G. W. Bardens, E. S. Weisner, and S. E. Bowman; and cattle, with Dr. T. H. Ferguson, chairman, aided by Drs. M. H. Roepke, F. A. Hall, C. H. Smith, and D. C. Wood.

c/H. A. LIDIKAY, *Secretary*.

Iowa

North Central Association.—One hundred veterinarians and their wives registered for the fall meeting of the North Central Iowa Veterinary Medical Association at Fort Dodge on Oct. 24, 1946. Featured speakers were Dr. P. O. Dorweiler, president of the association; Dr. M. H. Roepke, Department of Veterinary Science, University of Minnesota, who spoke on the work in swine diseases carried out at the Hormel Research Institute and the University of Minnesota Department of Veterinary Research; Dr. John W. Carey, general practitioner of West Liberty, who discussed problems in everyday practice; Dr. M. F. Hofstad of Iowa State College, who led a discussion of Newcastle disease [pneumoencephalitis]; and Dr. C. C. Franks, state veterinarian of Iowa.

Officers elected for the coming year are: Dr. O. N. Emerson, Eagle Grove, *president*; Dr. S. D. Linn, Humboldt, *president-elect*; Dr. B. J. Gray, Fort Dodge, *secretary-treasurer;* and Drs. C. L. Telleen of Gowrie and V. R. Howie of Manson, *members of the executive board*.

s/B. J. GRAY, *Secretary*.

• • •

Geneticist Honored.—The F. B. Morrison Award for 1946, presented by the American Society of Animal Production at its December 2 meeting in Chicago, was given to Dr. Jay L. Lush, professor of Animal Breeding at Iowa State College, Ames. The donor of the award, Dr. F. B. Morrison, distinguished head of the Animal Husbandry, New York State College of Agriculture, Ithaca, and his wife have made the award as a recognition of the help extended them by animal husbandry research workers in the revisions of the many editions of his widely used book "Feeds and Feeding."

The selection of Dr. Lush to receive the first of five yearly awards consisting of $1,000 in cash was based upon his research accomplishments in livestock breeding and feeding and his contribution to animal husbandry through his book "Animal Breeding Plans." He has served the Society of Animal Production as secretary, vice-president, and president.

Massachusetts

December Meeting.—The regular meeting of the Massachusetts Veterinary Association was held at the Hotel Statler in Boston on Dec. 18, 1946. Featured speaker at the dinner meeting was S. A. Maxwell, representative of the Boston Purina Company, whose subject was "Meat—Is It an Adequate Diet for Dogs?" A round-table discussion of developments in feeding followed Mr. Maxwell's presentation.

s/H. W. JAKEMAN, *Secretary.*

Michigan

December Meeting.—On Dec. 12, 1946, the Western Michigan Veterinary Medical Association met at Grand Rapids. Dr. C. F. Clark, state veterinarian, outlined Michigan's brucellosis program and the part practicing veterinarians were playing in the work. About 68 members and their wives attended the meeting.

s/FRANK THORP, JR.,
Resident State Secretary.

Mississippi

Farm Bureau Resolutions.—A broad program for the coming year is outlined in the *Mississippi Farm Bureau News* (Dec., 1946) by the Farm Bureau Federation which held its annual convention in Jackson on November 6-8. The farmers of the state were urged to support actively the resolutions of the Federation. The following section deals with veterinary training in the state.

"We believe that the best interests of all phases of the livestock industry in Mississippi, including poultry, require that consideration be given to the matter of training Mississippi boys in veterinary medicine. The tremendous student load on institutions with veterinary schools means that students from Mississippi will be practically excluded from training in this important field for at least the next four or five years, unless a regional plan is effected for such training or training is provided within the state.

"We recommend that the appropriate officials at Mississippi State College be strongly urged to give immediate attention to this problem and that they formulate a plan or plans that will insure the training of a sufficient number of Mississippi boys to meet the growing needs for veterinary service in the state."

The growing importance of the dairy industry in the state has given rise to the following recommendations by the Bureau: (1) that the Federation coöperate with other agencies in developing a plan for liberal feed supply for all dairy cattle, with special emphasis on permanent pastures, supplementary grazing, and protein supplements; (2) that the Federation foster a plan to standardize regulations governing production and marketing of milk and milk products; (3) that the Federation sponsor in every dairy county the Mississippi Artificial Breeders Coöperative as a means of improving productive breeding; (4) that the farm Bureau work with all other agricultural agencies toward a complete dairy research program on nutrition, breeding problems, herd management, disease control, processing, and marketing of products; (5) that the Federation work with state college authorities to bring outstanding farmers and business men to appear before upper classmen for lectures and forums.

s/JULES L. ARNANDEZ.

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State Association.—The forty-first annual meeting of the Mississippi State Veterinary Medical Association was held at Jackson on Jan. 16-17, 1947. After the address of welcome by Mayor Leland Speed, with the response by Dr. S. E. Osburne of Greenwood, and an address by President L. L. Denson, the veterinary program proceeded as follows.

Dr. W. M. Coffee, La Center, Ky.: "The Use of Whole Blood and the Technique of Transfusion in General Practice."

Dr. T. A. Sigler, Greencastle, Ind.: "Bovine Surgery."

Dr. J. W. Scales, State College: "Artificial Insemination."

Drs. J. V. Duckworth, Chas. W. Chadwick, Andy Crawford, and S. O. Galbreath, Jr.: "Veterans with Cattle to Greece."

Dr. B. T. Simms, president, AVMA, Washington, D. C.: "Current Activities of the AVMA," and "Poisonous Plants." Dr. Simms also showed special pictures on calves.

Four young veterinarians discussed with four older men in practice the subject: "Young Veterinarian Expectations."

A question box session was led by Drs. Coffee and Sigler.

s/GLENN D. GATES, *Secretary.*

Missouri

Kansas City Association.—Dr. H. E. Pinkerton of Fort Dodge Laboratories, Fort Dodge, Iowa, was the guest speaker at the December 17 meeting of the Kansas City Veterinary Medical Association held the the Hotel Continental. He talked on recent field and laboratory work in the important diseases of swine.

s/GAIL B. SMITH, *Secretary.*

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Fact-Finding Poultry Conference.—The Fact-Finding Conference of the Institute of American Poultry Industries will be convened at the Municipal Auditorium, Kansas City, February 2-4. Tops in registration, importance of the proceedings, new equipment, and entertainment are forecast.

Nebraska

Officers.—At its fiftieth annual convention Dec. 11-12, 1946, the Nebraska State Veterinary Medical Association elected Dr. O. H. Person, state senator-elect of Wahoo, as *president* for the coming year; Dr. B. F. Lott of York, *vice-president;* and Dr. L. V. Skidmore (reëlected), Lincoln, *secretary-treasurer.* Dr. J. L. George, Chester, and Dr. M. A. Latham, Grand Island, were reëlected to the Board of Directors, and Dr. Paul L. Matthews reëlected as resident state secretary for the AVMA.

New York

New York City Association.—Guest speaker at the January 15 meeting of the New York City Veterinary Medical Association was Dr.

James H. Steele, chief of the Veterinary Public Health Section, States Relations Division, Public Health Service, Washington, D. C. His subject was "Animal Reservoirs of Human Diseases."

s/C. R. SCHROEDER, *Secretary.*

—Acme Photo

Dr. Robert E. May administers free vaccine to one of the 125 dogs vaccinated in Nassau County, Long Island, where $25,000 was appropriated for the control of rabies.

Ohio

State Meeting.—The Ohio State Veterinary Medical Association held its sixty-third annual meeting in Columbus on Jan. 8-10, 1947. The following speakers participated in the three-day program.

Dr. J. L. Davidson, Department of Veterinary Medicine, Upjohn Co., Kalamazoo, Mich.: "A Review of Intravenous Fluids."

Dr. F. D. Egan, Farmington, Mich.: "The Physiology of the Alimentary Canal."

Dr. B. H. Gibson, London: Business Methods in Practice."

Dr. D. C. Wood, Greensburg, Ind.: "Sterility Problems in Cattle."

Dr. D. W. Baker, New York State Veterinary College, Ithaca: "Some Causes and Controls of Bovine Dermatitis." (Illustrated).

Dr. R. F. Smith, Boswell, Ind.: "Swine Diseases."

Dr. W. R. Krill, The Ohio State University, Columbus: "The Future of Veterinary Education."

A panel discussion on poultry diseases was headed by Dr. B. H. Edgington of the Ohio Agricultural Experiment Station, Reynoldsburg. Members of the panel were Drs. F. C. Tucker, Claypool, Ind.; H. E. Moses, Lafayette, Ind.; C. R. Cole, Columbus; and F. R. Koutz, Columbus.

Dr. R. E. Rebrassier, The Ohio State University, led the panel discussion on general practice. The following doctors assisted in the answering of questions and the discussion: B. H. Edgington, F. C. Tucker, H. E. Moses, C. R. Cole, F. R. Koutz, F. D. Egan, J. E. Davidson, C. L. Blakely, W. R. Krill, D. C. Wood, D. W. Baker, R. F. Smith, and B. H. Gibson.

In addition to auxiliary meetings, the ladies enjoyed a luncheon, special programs, a tea, evening social hour, and, with their husbands, the banquet and dance.

s/ F. J. KINGMA, *Secretary.*

Oklahoma

"Shingle on Wings."—Of interest to all veterinarians was the article under this title in the Nov. 9, 1946, issue of *Collier's* magazine. The subject of the story is Dr. C. A. Mohr, Jr., (TEX '42) of Tulsa, whose combination of medical skill with flying skill sends him into Texas, Kansas, Arkansas, Missouri, and other states to save animal lives. Three Army surplus planes, a Stinson L-5, a Consolidated Vultee BT-13, and a Fairchild PT-19, are equipped for different purposes. Such equipment as a sterilizer, a portable x-ray, an inhalator, and a refrigeration unit has transformed these vehicles into mercy ships for the southwest cattle country.

Following in the footsteps of his veterinarian father, C. A. Mohr, Sr., who has practiced in

—From Colliers

Dr. Charles A. Mohr, Jr., and one of his three planes, a Stinson L-5.

Oklahoma since 1911, Dr. Mohr's student record in veterinary medicine and surgery at Texas A. & M. College was particularly outstanding. Between the time he started practice in June, 1941, and 1945, when he took up flying, he wore out four cars making calls over the state.

Pennsylvania

Conference of Veterinarians.—The forty-seventh annual conference of veterinarians was held at the School of Veterinary Medicine, University of Pennsylvania, on Jan. 7-8, 1947. After

an address of welcome by Dean Raymond A. Kelser, the following speakers contributed to the program.

Dr. E. A. Churchill, University of Pennsylvania: "Extirpation of Mammary Tumors."

Dr. A. G. Danks, New York State Veterinary College, Ithaca: "Some Surgical Diseases of Cattle."

Colonel Raymond Randall, V.C., Army Veterinary School, Washington, D. C.: "Leptospirosis."

Dr. H. W. Schoening, Pathological Division, U. S. BAI, Washington: "The Newcastle Disease Situation in the United States."

Dr. C. P. Bishop, Pennsylvania BAI, Harrisburg: "Newcastle Disease in Pennsylvania and Recommendations for Its Control."

Dr. J. C. Shaw, University of Maryland, College Park: "Ketosis."

Dr. Richard E. Shope, The Rockefeller Institute for Medical Research, Princeton, N. J.: "Contributions to Human Medicine from Research in Animal Diseases."

Dr. Mark Allam, University of Pennsylvania: "Sterilization and Aseptic Technique in Veterinary Practice."

Dr. J. V. McCahon, Downington: "Some Diseases of Cattle."

Dr. James A. Baker, The Rockefeller Institute for Medical Research, Princeton, N. J.: "Attenuation of Hog Cholera Virus for Swine by Passage in Rabbits."

Dr. L. Reddin, Jr., Medical Department, Merck & Co., Rahway, N. J.: "Antibiotics of Use in Veterinary Medicine."

Dr. E. W. Price, U. S. BAI, Washington, D. C.: "Progress in Veterinary Parasitology with Special Reference to Practical Methods of Control of Internal Parasites of Livestock."

Dr. G. W. Luttermoser, University of Pennsylvania: "The Use of New Insecticides for the Control of External Parasites of Animals."

Dr. Clyde I. Boyer, University of Pennsylvania: "The Value of Blood Examinations in Veterinary Medicine."

s/ J. D. BECK, *Chairman.*

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Bucks-Montgomery Association.—The Bucks-Montgomery Veterinary Medical Association was reorganized Dec. 11, 1946, at Doylestown. The business meeting was followed by a round-table discussion of brucellosis and tuberculosis.

Officers for the coming year are: Dr. Edwin P. Taylor, Buckingham, *president;* Dr. Henry H. Stover, Langhorne, *vice-president;* and Dr. J. G. Shute, Doylestown, *secretary-treasurer.* Dr. Stover was also elected to the Board of Trustees and to the membership committee of the Pennsylvania state association.

s/ J. G. SHUTE, *Secretary.*

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Phi Zeta Fraternity.—A luncheon and initiation of the Beta chapter of the Society of Phi Zeta was held Jan. 25, 1947, at Houston Hall, University of Pennsylvania, Philadelphia. Eight students, four staff, and one honorary member were initiated. An afternoon of inspirational fellowship followed.

s/ D. K. DETWEILER, *Secretary.*

Grayson Foundation Plans.—Mr. Walter M. Jeffords, president of the Grayson Foundation, Inc., has announced that Dean R. A. Kelser, School of Veterinary Medicine, University of Pennsylvania, vice-president of the Foundation, will direct its research projects along four chief lines: virus abortion in mares; periodic ophthalmia; nutritional diseases and conditions including degenerative arthritis; and influenza and its complications. Organized in 1940 to encourage research in horse diseases, the group was unable to advance its programs until scientists and laboratory facilities became available after the war. Work on the current program is expected to begin early this year.

Rhode Island

Veterinary Practice Act.—In an article from the *Providence Journal* (Dec. 3, 1946), it is reported that the constitutionality of Rhode Island's Veterinary Practice Act has been questioned. The law states that any graduate, to be eligible to take State Board examinations, must be a graduate of a recognized veterinary college accredited by the AVMA.

The State Board of Veterinarians had refused to examine Cyril James Allen, who attended Middlesex University School of Veterinary Medicine in Massachusetts, not on the list approved by the AVMA. This Board was summoned into court to show why a writ of mandamus should not be issued against it. Judge Alexander L. Churchill of Superior Court rendered the decision that the law was unconstitutional, as it delegated accrediting authority to an outside agency.

The Board of Veterinarians, which has been inactive since mandamus proceedings were instituted, hopes to have the law amended during the state legislature now in session.

Texas

Annual Meeting.—The Texas Veterinary Medical Association held its annual meeting at Houston on Jan. 20-21, 1947. The program featured the following speakers.

Dr. Austin E. Hill, M.D., Houston Health Department: "The Veterinarian in Relation to Public Health."

Mr. Dooley Dawson, Agricultural Department, Second National Bank, Houston: "Veterinarians and Soil Conservation."

Dr. W. M. Fisher, M.D., Baylor Medical College: "Public Health and the Veterinarian."

Dr. James H. Steele, U. S. Public Health Service, Washington, D. C.: "Veterinary Public Health."

Dr. C. P. Zepp, New York, N. Y.: "Every Day Canine Practice"; Dr. J. G. Horning led the panel discussion.

Dr. A. G. Madden, Madeira, Ohio: "The Trials and Tribulations of a Pleasure Horse Practice"; Dr. J. O. Whitehead led the panel discussion.

Dr. F. P. Jaggi, Texas A. & M. College, College Station: "Hotis Test Demonstration."

Dr. R. D. Turk, Texas A. & M. College, College Station: "Parasites of Cattle."

Dr. J. F. Knappenberger, Hutchinson, Kan.: "Cattle Practice"; Dr. J. W. Williamson led the panel discussion.

s/E. A. GEIST.

Junior Chapter.—At its November 19 meeting, the junior chapter of the AVMA at Texas A. & M. College had as its speakers Dr. I. W. Rupel, head of the Dairy Husbandry Department; Mr. F. I. Dahlberg, acting head of the Animal Husbandry Department; and Dr. E. A. Grist, extension veterinarian. Emphasis was placed on the three aspects of veterinary practice represented by these men and also upon the location of veterinarians in Texas in relation to livestock population.

The Borden Award for the outstanding senior student went to Charles B. Bucy of Raymondville, who had maintained the highest scholastic average for the previous three years.

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Panhandle Meeting.—The Panhandle Veterinary Association held its semiannual meeting Nov. 9, 1946, at Lubbock. Dr. W. G. Brock of Dallas demonstrated firing technique and the technique of castration while standing. Dr. W. A. Boney, Jr., of the Texas Agricultural Experiment Station discussed poultry practice problems. Following a luncheon for veterinarians and their wives, the group attended the New Mexico-Texas Tech football game.

Wisconsin

Annual Meeting.—The Wisconsin Veterinary Medical Association held its thirty-second annual convention at Madison on Jan. 15-17, 1947. The following speakers were featured.

Dr. E. R. Frank, Kansas State College, Manhattan: "Animal Surgery;" discussion by Dr. R. B. Hippenbecker, Fennimore, and Dr. W. F. Nolecheck, Thorp.

Dr. Harvey Hoyt, Veterinary Control Laboratory, University of Wisconsin, Madison: "Postmortem Diagnosis;" discussion by Dr. C. A. Brandly, Madison, and Dr. Rolland Anderson, Elkhorn.

Dr. R. E. Rebrassier, The Ohio State University, Columbus: "New Anthelmintics and Insecticides;" discussion by Dr. Bob Curtis, Portage, and Dr. C. W. Burch, Platteville.

Dr. C. F. Schlotthauer, Mayo Foundation, Rochester, Minn.: "Some Common Small Animal Diseases;" discussion by Dr. C. M. Heth, La Crosse, and Dr. Claude Reading, Madison.

Dr. J. S. Healy, USDA, Madison: "Animal Disease Control Activities."

Dr. V. S. Larson, Department of Livestock Sanitation, Madison: "Report of Director of Livestock Sanitation."

Dr. W. L. Boyd, University Farm, St. Paul, Minn.: "Mastitis and the Practitioner."

Dr. G. R. Spencer, University of Wisconsin, Madison: "Mastitis Research Progress Report."

Dr. Geo. Hopson, DeLaval Separator Co., New York: "Mastitis Control."

Dr. S. H. McNutt, University of Wisconsin, Madison: "Swine Brucellosis."

Dr. R. R. Birch, New York State Veterinary College, Ithaca: "Bovine Brucellosis Control;" discussion by Dr. J. R. Fessler, Janesville, and Dr. W. W. Arzberger, Watertown.

Participants in the mastitis panel discussion were Drs. W. L. Boyd, Geo. Hopson, W. Wisnicky, T. H. Ferguson, G. R. Spencer, J. O. McCoy, W. O'Neil, Mort Hutchinson, and Robert Hauke.

FOREIGN

Australia

Butterfat Record.—In having produced 32,522 lb. of milk containing 1,614 lb. of butterfat, the Milking Shorthorn cow, Melba XV of Barbalara, established a 365-day butterfat record in 1924 that remains unbeaten. Questioned in the United States as to the reliability of the test, investigations established Melba as the all-time, all-breed champion butterfat producer of this day. The test was made under the supervision of the Dairy Branch, New South Wales Department of Agriculture.

China

First Veterinary College.—At the National Lanchow University, located in Kansu province in northwest China, the first Chinese veterinary college was founded last fall. Dr. H. J. Stafseth, professor of bacteriology at Michigan State College, East Lansing, aided by two American missionaries of long experience in China, had the good fortune to be able to furnish the necessary "spark" in approaching government officials to start this long-neglected project.

The dean of the school is capable and energetic Dr. T. S. Sheng, who was educated in Germany and holds the M.D. and D.V.M. degrees. There are only about fifteen Chinese veterinarians, graduated from recognized American and European institutions, in all of China. The college needs books, journals, reprints, and usable instruments. Veterinarians in this country are urged to donate any of these items which they no longer need.

s/H. J. STAFSETH.

France

Notable Centennial Celebration—*L'Académie vétérinaire de France* celebrated the hundredth anniversary of its foundation in Paris, Dec. 19, 1946. The society was created in 1844 under the name of *Société Centrale de Médecine vétérinaire* which was transformed to *Académie vétérinaire de France* in 1928. The only one that exists in academic form, it represents one of the oldest scientific veterinary institutions of the world.

The commemoration was a formal assembly held under the presidency of the Minister of Agriculture in the presence of the scientific bodies of Paris, delegations from different scientific societies, and numerous representatives of domestic and foreign veterinary organizations. The American Veterinary Medical Association was represented by Col. Frank Todd, chief veterinarian of the American Army of Occupation. Numerous addresses followed the work of the meeting. These comprised an allocution by President M. Bressou, director of the Alfort school, a discourse by M. Magne, member of the Academy, on "Veterinary Humanism," following which the medals of the Academy were awarded to foreign members, recently elected associates, or correspondents. Brig. Gen. Raymond A. Kelser was awarded

a medal, the "Effigy of Bourgelat", the founder of veterinary colleges.

The delegates of foreign societies, one by one, then presented to the office the addresses, letters, and telegrams they had brought to the occasion.

Colonel Frank Todd, V. C., U. S. Army, deposited a telegram from Dr. B. T. Simms, president of the American Veterinary Medical Association, which brought great applause from the audience. An allocution by the Minister closed the ceremonies.

A reception was held at salons of the Centre Marcelin-Berthelot, and a dinner to the foreign delegates was given by the Academy in the salons of the Hotel Lutecia where Col. Todd presented his confraternal respects to the veterinarians of France and the esteem of the members of the American Veterinary Medical Association.

S/PROF. M. BRESSOU, *Director of Alfort.*

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Centenary of the Academy of Surgery.—Another centennial celebration was that of *Académie de Chirurgie* at Paris. The Academy of Surgery was founded in 1843 but was in reality a continuation of the Royal Academy of Surgery founded by Louis XV in 1731. These centenaries distinguish the 1840's as a decade of lively interest in medical and veterinary organization. Like the Veterinary Academy of France, the Royal College of Veterinary Surgeons of Britain was founded in 1844.

Great Britain

New Principal at "Royal (Dick)."—The new principal of the Royal (Dick) Veterinary College is Prof. W. M. Mitchell, an alumnus of the institution, thirty years a member of its teaching staff, and a famed surgeon. The Dick school, the second of the three Edinburgh veterinary colleges, founded in 1823 by William Dick whose name it has borne these 124 years, has the fascinating history of having contributed most to the shaping of veterinary education in North America through the immigration of distinguished graduates to Canada and the U. S. A. Professor Mitchell holds the F. R. C. V. S. title and B. Sc. and M. B. degrees of Edinburgh University, saw service in the R. A. V. C. in World War I and in the R. A. M. C. in World War II.—*From Canad. J. Comp. Med. and Vet. Sci., 10, (Sept., 1946): 249.*

Holland

Memorable Anniversary.—The Dutch National Association of Veterinarians held its annual meeting in Utrecht in December, 1946. At the close of the session, the members celebrated with a banquet the 125th anniversary of veterinary education in Holland. Dr. L. Seekles, president of the faculty at Utrecht, addressed the group on this occasion.

S/C. H. HAASJES.

New Zealand

Milk and Health.—"Any proposal for the elimination of disease among farm stock must command earnest attention. New Zealand derives practically the whole of her exportable wealth from the products of animal husbandry. Her climate and the initiative and resource of her farmers have given her a larger per capita export trade, both in volume and in value, than that of any country in the world." So reads the opening statement of an editorial in *The New Zealand Herald*, Auckland, July 15, 1946; and a little later it says "The provision of an adequate veterinary service is the first essential for the improvement of the health of our farm animals, and, if it is linked up with definite lines of attack which have proved effective in other countries, real progress should be made."

In discussing the proposal to place all milk-processing plants under government ownership, the editorial says, "When the State, through a satellite corporation, is judge and jury in any appraisal of the efficiency of its milk treatment, there will be no redress for the public. The monopoly will not only have the absolute right to treat all milk destined for consumption in the urban areas, but by its very position will be able to dictate to both producers and vendors, and finally to the consumer." The final statement is, "The ultimate sufferer will be the consumer. He will have to foot the bill."

COMING MEETINGS

Institute of American Poultry Industries. Fact Finding Conference. Municipal Auditorium, Kansas City, Mo., Feb. 2-4, 1947. Cliff D. Carpenter, Institute of American Poultry Industries, 110 N. Franklin St., Chicago 6, Ill., president.

Connecticut Veterinary Medical Association, Hotel Bond, Hartford, Conn., Feb. 5, 1947. G. E. Corwin, 36 Capitol Ave., Hartford 6, Conn., secretary.

Veterinary Medical Association of New Jersey. Hotel Sheraton, Newark, N. J., Feb. 6-7, 1947. J. R. Porteus, P. O. Box 938, Trenton, N. J., secretary.

Arkansas Veterinary Medical Association. Little Rock, Ark., Feb. 13, 1946. C. T. Mason, 906 Broadway, Little Rock, Ark., secretary-treasurer.

Colorado A. & M. College. Annual Short Course for Veterinarians. Division of Veterinary Medicine, Colorado A. & M. College, Fort Collins, Feb. 17-19, 1947. I. E. Newson, Division of Veterinary Medicine, dean.

American Animal Hospital Association. Tulsa, Okla., April 22-24, 1947. R. E. Ruggles, 901 19th St., Moline, Ill., secretary.

American Veterinary Medical Association. Eighty-fourth Annual Session. Netherland Plaza Hotel, Cincinnati, Ohio, Aug. 18-22, 1947. J. G. Hardenbergh, American Veterinary Medical Association, 600 S. Michigan Ave., Chicago 5, Ill., executive secretary.

Eastern Iowa Veterinary Association, Inc. Hotel Montrose, Cedar Rapids, Iowa, Oct. 14-15, 1947. Laurence P. Scott, P. O. Box 325, Waterloo, Iowa, secretary.

Chicago Veterinary Medical Association. Palm-

er House, Chicago, Ill., the second Tuesday of each month. Robert C. Glover, 1021 Davis St., Evanston, Ill., secretary.

Massachusetts Veterinary Association, Hotel Statler, Boston, Mass., the fourth Wednesday of each month. E. A. Woelfer, c/o A. P. Hood & Sons, Boston, Mass., secretary-treasurer.

New York City Association. Hotel Pennsylvania, New York, N. Y., the first Wednesday of each month. C. R. Schroeder, Lederle Laboratories, Inc., Pearl River, N. Y., secretary.

Saint Louis District Meetings, Roosevelt Hotel, St. Louis, Mo., the first Friday of each month. C. W. Darby, Dept. of Animal Pathology, Ralston-Purina Co., St. Louis 2, Mo., secretary.

Houston Veterinary Medical Association. Houston, Texas, the first Thursday of each month. Edward Lepon, Houston, Texas, secretary-treasurer.

BIRTHS

To Lt. (UP '44) and Dr. (UP '45) Oscar L. Boyd, Jr., Route 2, Staunton, Va., a daughter, Lynn Anne, Sept. 9, 1946.

DEATHS

★**Antoon Busser** (MSC '40), 30, Auburn, Ind., died of a heart attack Nov. 17, 1946. He was admitted to the AVMA in 1940.

★**F. H. Callahan** (KSC '29), 43, Abilene, Kan., died Oct. 19, 1946, while on a hunting trip in Nebraska. Dr. Callahan had been a member of the AVMA since 1930.

Wm. Dekker-Van Ghyl (KSC '35), Frederick, Md., died July 7, 1946, of chronic glomerular nephritis, at the Johns Hopkins Hospital, Baltimore, Md.

John E. Lynch (IND '07), Indianapolis, Ind., died in October of 1946.

Thomas A. Mabie (KCVC '04), Kansas City, Kan., died Dec. 26, 1946, while on a professional call. For forty-two years a Kansas City practitioner, he had made a practice of taking blind and otherwise disabled horses and mules off the streets by purchasing those he found and retiring them from service.

W. D. MacDonald (ONT '15), 63, Moose Jaw, Sask., pioneer practitioner of the Canadian Northwest, and the son of one of the early settlers of Saskatchewan, died July 20, 1946. His parents migrated from Ontario in 1905. He was president of the provincial association for a numbers of years and an executive in the veterinary licensure work with which that association is entrusted.

T. A. MacMahan (CVC '12), 85, Lyons, Neb., died on Sept. 11, 1946.

Harold G. Nelson (CORN '24), Port Jefferson Station, Long Island, N. Y., died July 24, 1946.

★**A. D. Paley** (MCK '10), 65, Lake Forest, Ill., died in December, 1946. Dr. Paley was born at Leeds, England, on April 21, 1881. He had been a member of the AVMA since 1920.

★**A. W. Smith** (NYC '98), 70, Bloomfield, N. J., died Dec. 17, 1946. Dr. Smith was admitted to the AVMA in 1924.

C. F. Stout (IND '09), Indianapolis, Ind., died at Fort Lauderdale, Fla., in October, 1946.

Maynard N. Tanner (MCK '10), Westfield, N. Y., died March 29, 1946.

★**S. B. Till** (API '22), 48, Columbus, Ga., died Dec. 19, 1946. After his graduation from Alabama Polytechnic Institute, he was connected with the North Carolina Department of Agriculture in TB eradication work. Later, he was in the health departments of Goldsboro, Durham, and Asheville, N. Car., as city meat and milk inspector. He was manager of the Wells Dairy at Columbus until his death. Dr. Till was admitted to the AVMA in 1937.

★Indicates member of the AVMA.

VETERINARY MILITARY SERVICE

Awards and Citations

Colonel Frank C. Hershberger, V.C., received the Legion of Merit award and the Army Commendation Ribbon "for exceptionally meritorious conduct in the performance of outstanding services" during the period from December, 1941, to November, 1945.

Veterinary Officers Separated from Military Service

California
Chapman, John H.
Kelber, William J.

Colorado
Hanks, Sidney F.

Delaware
Daugherty, E. B.

Georgia
Davis, Thomas C.

Illinois
Bott, Anthony R.

Iowa
Bailey, James W.
Baker, Durwood L.
Blair, Alvin E.
Ward, Norman R.

Kansas
Elliott, Wm. Dean
Grandfield, Roy M.
Schoen, Edwin A.
Stonebraker, E. K.

Kentucky
Waite, Edward G.

Massachusetts
Phillips, Warren A.

Michigan
Goodband, George C.
Westcott, Roy Wm.
Wise, Gilbert H.

Nebraska
Campbell, Thomas C.

New Jersey
Simpson, Charles F.

New York
Coye, Elmer N.
Mettler, J. J., Jr.
Porter, David B.
Rogoff, George
Sall, Irving E.

North Dakota
Calhoun, William H.

Ohio
Heinrich, Cyril L.
Heinsen, Paul B.
Stockton, Jack J.

Pennsylvania
Bender, John W.
Dougherty, E.
Finkelstein, Jacob
Huebner, Richard A.
Ramey, Donald B.
Steadman, Henry R.

Texas
Farrell, J. M., Jr.
Garrett, Robert M.
Grimes, George E.
Kerby, Duron R.
Riley, William E.

Utah
Isakson, Eric W.

Washington
Ament, Roland W.
Herbert, Earl W.
Ryncarz, A. J.

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4th. When used in large dosage in treating known exposed animals the percentage of failure is almost negligible.

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This formula was developed and perfected by Drs. Millenbruck and Wallinga, while serving at the Army Veterinary Hospital, Ft. Riley, Kansas.

Equi-Thesin contains in each 500 cc.: Chloral Hydrate 328 gr., Pentobarbital 75 gr., and Magnesium Sulfate 164 gr., in an aqueous base of Propylene Glycol with 9.5 per cent Alcohol.

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